2012-06

NPS Value Book: A Strategic Valued Investment

Monterey, California: Naval Postgraduate School

NAVAL
POSTGRADUATE
SCHOOL

VALUE BOOK

A STRATEGIC VALUED INVESTMENT

VOLUME 1 • PUBLISHED WORKS

TABLE *of* CONTENTS

EXECUTIVE MESSAGE

"What is the value of the Naval Postgraduate School?"

This simple and straightforward question, in times of budgetary challenges and difficult decisions, has been posed to leaders of NPS many times. And rightly so, for when an institution is the steward of public funds and trust, it simply must ensure there is persistent value in everything it endeavors, at all times.

This is also a question that the leadership of this institution, and many others, have answered many times, and in many forms, throughout the university's history. Whether it be written word or spoken thought, detailed analysis or alumni testimonials, the value of NPS has been documented many times over.

In early 2011, recognizing the collective intellect within the academic halls of our campus, I asked CDR Doug Burton to form the Question-Team, or Q-Team, to study the intricacies of determining value for an institution such as NPS. The charter of this team was to "produce research questions about the value of NPS" while considering "all relevant perspectives."

After several weeks of detailed examination and research, the Q-Team presented their report to NPS' leadership, and much of what they uncovered during this process told a compelling story. Articles dating back many years through current works, detailed studies and data sets, all documenting and demonstrating real value. While the Q-Team's report highlighted several important variables in analyzing institutional value, it also set NPS upon a course of compiling the evidence that would answer that all-important question. The result is this multi-volume Value Book.

Within these pages lies the beginning of what will be an ever-expanding resource both within and beyond the halls of NPS. The documentation contained in these volumes is organized as follows:

VOLUME 1 — PUBLISHED WORKS
This compilation of previously published works provides written testaments to the value of NPS. Each work begins with a one-page Executive Summary highlighting key points within the article. The full text of each document follows.

VOLUME 2 — ALUMNI and FRIENDS
This volume presents those honored individuals who are current members of the NPS Hall of Fame, and our Distinguished Alumni. Each of these leaders is represented by a biography and a few select published articles giving context to their contributions to the defense establishment. This volume also contains several direct quotations from key leaders throughout the world, offering their own testament to NPS' worth.

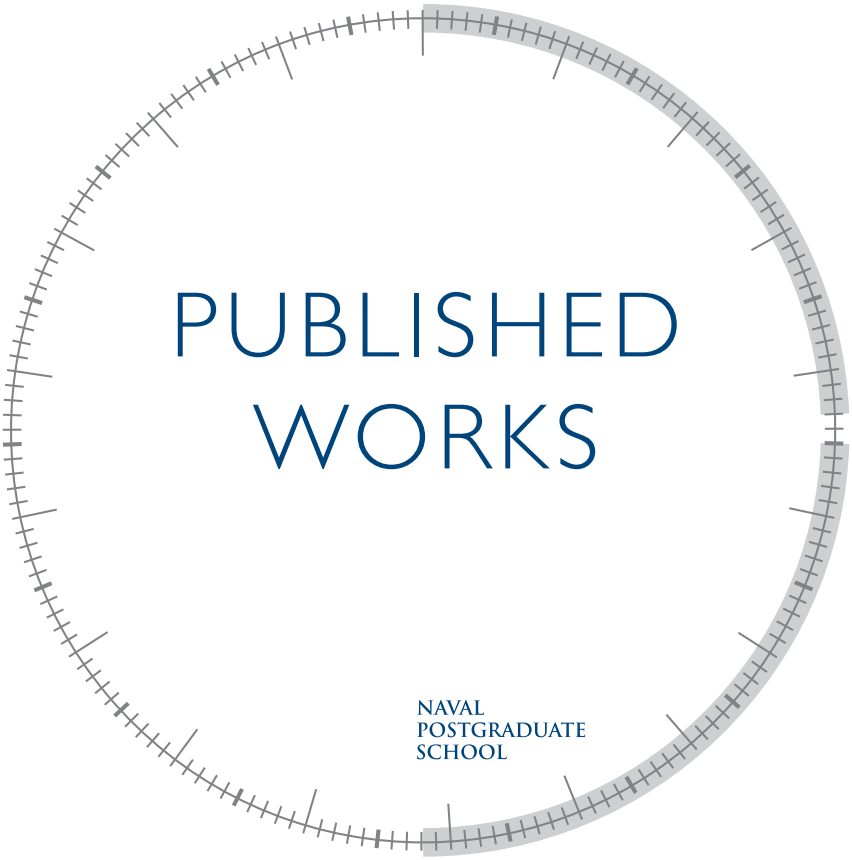
VOLUME 3 — BENCHMARKING and ANALYSES
In this volume are gathered together all the data collection and analyses in which NPS compares itself against a set of peer institutions. Comprising such topics as faculty salaries, staffing, graduation rates and more, these reports are updated each year.

VOLUME 4 — SURVEYS
NPS regularly conducts surveys of graduating students and alumni. Additionally, ad hoc surveys for specific purposes are administered. This volume presents all the reports, with annual and historical trends, which have been completed using survey data.

I invite you to explore these resources, and begin to formulate your own answer to the question, "What is the value of NPS?" Better yet, please do not hesitate to contribute or suggest content for these resources through the NPS Office of Institutional Advancement at pao@nps.edu. While we believe these volumes create a truly compelling story, we also hope it represents only the beginning.

Thank you.

Dan Oliver
President, Naval Postgraduate School


PUBLISHED
WORKS
NAVAL
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TITLE

Education and Training Joint Cross Service Group Professional Development Education Subgroup JPME/PME

SOURCE NPS Internal Document, Author Unknown, 2004

ABSTRACT While preparing for BRAC, this table of comparative military value was generated. This looks at the Naval Postgraduate School compared to 17 other military schools.

EXCERPT The Naval Postgraduate School received the highest "numerical military value score of 74.7 in graduate education" — the highest score of all 17 military schools studied.

CD REF NO. PW–1

Education and Training Joint Cross Service Group	
Professional Development Education Subgroup	
JPME/PME	
Installation/Location	**Numerical Military Value Score**
Marine Corps Base Quantico, VA	65.3
Ft. Leavenworth, KS	59.3
Maxwell AFB, AL	53.8
Carlisle Barracks, PA	53.6
Ft. McNair, DC	52.7 *
Naval Station Newport, RI	52.5
Naval Station Norfolk, VA	47.5
Graduate Education	
Monterey, CA (Naval Postgraduate School)	74.7
Wright-Patterson AFB, OH (Air Force Institute of Technology)	52.0
Other Full Time Education (***Defense Agencies***)	
Ft. Belvoir, VA (Defense Acquisition University)	58.8
Memphis, TN (Defense Contract Audit Institute)	40.5
Patrick AFB, FL (Defense Equal Opportunity Management Institute)	43.7
Other Full Time Education (Chaplains)	
Ft. Jackson, SC	51.6
Maxwell AFB, AL	41.3
Naval Station Newport, RI	34.1
Other Full Time Education (JAGs)	
Maxwell AFB, AL	45.4
Charlottesville, VA	33.5
Naval Station Newport, RI	33.2

* Fort McNair's military value score did not include data for Lincoln Hall nor buildable acres, reference 2 Feb 05 E&T JCSG meeting minutes.

TITLE

What is the Value of NPS

PLEASE NOTE

The only name found associated with this document is G. W. Conner who made revisions on 7/10/03.

ABSTRACT

The outline gives an overview of the objectives and values of the Naval Postgraduate School curricula. Stressed are NPS' unique programs as essential to the Navy's and other armed services officers' combat-effectiveness, as well as educating officers from over 50 countries. NPS' costs are reviewed and compared to costs for graduate degrees at civilian universities.

EXCERPTS

"Cost comparisons are being made erroneously between civilian universities market price (tuition) and NPS full costs. Tuition covers 15–25% of public and 25–30% of private universities' full cost … Analysis has shown NPS to be average to below average in total costs."

"NPS is in the forefront providing specialized programs that support U.S. national security priorities, including counterterrorism, homeland security, and security cooperation."

"Whereas the NPS metric of effectiveness is to take proven warfighters, sometimes with low GPAs, and recast them as strong technical graduate students; the same students, however, would not gain entry into Tier One schools whose metric of effectiveness is much different and not meant to measure the effectiveness of a proven combat warrior leading people and managing complex weapons systems."

"Immediate access to cutting-edge IT R&D work will be terminated if NPS is closed. More generally, the synergistic combination of graduate education in disciplines and curricula critical to the future of our defense establishment with high-impact research in crucial technologies directly relevant to DOD's mission is simply not found in either national laboratories with no capacity or interest in educating military officers or in civilian universities that engage in little or no defense R&D."

"Future multinational operations that will be ever more important as we wage the GWOT will suffer if the extensive mutual understanding, trust, and goodwill that results from intensive interactions across this 'global' population of future military leaders are terminated by the closure of NPS."

CD REF NO. PW–2

What is the Value of NPS?

It is by no means enough that an officer of the Navy should be a capable mariner. He must be that, of course, but also a great deal more. He should be as well a gentleman of much education, refined manners, punctilious courtesy, and the nicest sense of personal honor.

Charles V said that a man who knew four languages was worth four men; and Alexander the Great so valued learning, that he used to say he was more indebted to Aristotle for giving him knowledge that than his father Philip for giving him life.

THE NAVAL POSTGRADUATE SCHOOL IS THE NAVY'S UNIVERSITY

- Essential to the Navy's education continuum for ensuring combat-effectiveness of military and civilians
- Integral to joint and combined professional military education
- Inextricably linked to the Unified Combatant Commanders
- A key element in the nation's national security strategy
- Vital to DoD's interactions with other agencies and nations for national security

ESSENTIAL TO THE NAVY'S EDUCATION CONTINUUM FOR ENSURING COMBAT-EFFECTIVENESS OF MILITARY AND CIVILIANS

- NPS offers education in Monterey and around the world with a full array of short courses, certificates and mobile education.
- NPS provides engineering, technical, analytical, managerial, and national security programs not available at civilian institutions to the Department of the Navy and most other national security organizations.
- The Navy is provided robust, high-quality resident education programs to meet the needs of the naval services for operating in a joint environment. The Navy is also provided augment residential programs with distance learning programs.

INTEGRAL TO JOINT AND COMBINED PROFESSIONAL MILITARY EDUCATION

- The student body reflects the operating environment. By 2006, 1800 military officers, defense civilians, enlisted, defense contractors, and other agency representatives from the United States and other nations will be studying in resident programs at NPS.
- Another 4,000 or more students will be enrolled in degree or certificate programs around the world.
- NPS is partnered with many defense and civilian university partnerships that allow NPS to deliver defense-related education when and where it is needed. A few notable examples of new and expanding partnerships include:
  - ~ The Air Force Institute of Technology and NPS provide education that allows the conceptualization, development and use of weapons systems by our military forces.
  - ~ Naval War College for Joint Professional Military Education.
  - ~ Stanford University for Homeland Security.
  - ~ University of Maryland, Smith School of Business for a defense-related MBA.
- The "pocket model" of insurgency and counter-insurgency developed in the Seminar on Guerrilla Warfare provided the framework that was used to successfully prosecute the campaign against the Abu Sayyaf Organization in the Philippines between 2001–2002.
  - ~ The campaign was developed by SOCPAC under the command of General Wooster.
  - ~ Several SOLIC graduates lead the planning effort, putting the model they had learned into practice.
  - ~ General Wooster uses this as an example of the interrelationship between education and operational effectiveness.

INEXTRICABLY LINKED TO THE UNIFIED COMBATANT COMMANDERS

- NPS works closely with the Unified Combatant Commanders to provide the relevant education and research critical to the combat mission. NPS faculty will work with the UCC's on real world

problems, on-site and with students back on the main campus. Recent 2002–2003 examples of this include:

- ~ Homeland Defense and Security programs for Northern Command and Pacific Command.
- ~ Counterterrorism programs in support of Unified Combatant Commanders initiatives.
- ~ NPS faculty and students' direct support to Millenium Challenge 02 for Joint Forces Command.
- ~ For Special Operations Command, a Special Ops curriculum and related research on UAV's, tactical decision aids, and other warfighting advances.
- ~ Information security for Strategic Command.
- ~ Graduate education for National Guard division staffs deploying to Europe Command countries.
- ~ NPS faculty provide about $75 million of research to the Navy, Unified Combatant Commanders and the Services.

VITAL TO DOD'S INTERACTIONS WITH OTHER AGENCIES AND NATIONS FOR NATIONAL SECURITY

- NPS is in the forefront providing specialized programs that support U.S. national security priorities, including counterterrorism, homeland security, and security cooperation. We developed master's degree programs and seminars on Homeland Defense and Security, as well as Counterdrug Strategy and Policy, for the Department of Homeland Security, Chief of Naval Operations, NORTHCOM, and the National Guard.
- NPS programs strengthen democratic civil-military relationships in countries throughout the world.
  - ~ National security decision-making in Indonesia
  - ~ National security strategy development in Colombia
  - ~ Ministry of Defense reorganization in Taiwan
  - ~ Security building in Afghanistan
- NPS teaches a classified graduate education program for NSA.
- University of choice for NRO.
- Homeland Defense and Security graduate program for the Department of Homeland Security, NORTHCOM, and the National Guard.
- NPS has strong links with NASA in focused areas of space research, and offers education and training for future astronaut candidates. NASA sponsors the annual Michael J. Smith NASA Chair at NPS.
- NPS receives sizeable annual funding from the National Science Foundation for basic research in oceanography, meteorology, information sciences, engineering, technology development, often partnering with other universities on interdisciplinary research projects.
- Afghanistan, Iraq: Training National Guardsmen for their deployments.
- Iraq: Assisting senior Iraqi officials' staff on how best to develop a national security strategy, manage limited resources, and further civilian-military relations.
- Afghanistan, Tajikistan, and Kazakhstan: Enhance U.S. bilateral security cooperation with Central Asian countries by assisting these countries on defense resources and management.

COST

- Items that drive costs at NPS:
  - ~ Stated requirements called Educational Skill Requirements which drive education in addition to degree requirements.
    - – Navy's requirement is for the ESR; degrees are issued to individuals.
    - – Credit hours of instruction to meet the Navy's stated requirements are greater than the degree requirements.
  - ~ Year-round operations:
    - – Many civilian universities do not have a full schedule available in the summer term.
    - – NPS accepts new fleet warriors each quarter into all of its curriculums.
    - – Most civilian institutions are lock-step and if a student does not matriculate in the Fall than they must wait until the following year to start.
  - ~ Cost that NPS endures in converting non-technical warfighters from the fleet into technical graduate students who earn technical degrees and return to the fleet.
  - ~ NPS metric of effectiveness is to take proven warfighters, sometimes with low GPAs, and recast them as strong technical graduate students.
    - – The same students, however, would not gain entry into Tier One schools whose metric of effectiveness is much different and not meant to measure the effectiveness of a proven combat warrior leading people and managing complex weapons systems.
  - ~ NPS supports Navy and Marine Corps with directly applied research, advice, and work.

COST COMPARISONS

- Comparisons are being made erroneously between civilian universities' market price (tuition) and NPS full costs.
- Tuition covers 15–25% of public and 25–30% of private universities' full cost.
  - ~ One would wonder why a civilian university would provide large numbers of degrees to Naval officers at the cost of tuition.
  - ~ USAF discovered (during their attempts to close AFIT) that in order to meet the stated requirements, civilian universities were 15–90% more expensive in all cases, and they wanted guaranteed source of funding that went beyond tuition; AFIT was the best value.
  - ~ Analysis has shown NPS to be average to below average in total costs.
  - ~ If Navy pays only tuition, then Navy does not meet its stated/verified/certified requirements.
- Navy believes that tuition for a graduate degree will be $27,000 at a civilian university.
  - ~ This is a academic year charge which is for nine months.
  - ~ Studies have shown the total cost of an NPS degree is $36,000 for twelve months of tailored instruction.
    - – Other costs at NPS are spread to support tenants, research which is a part of the NPS mission, and administrative overhead for the civilian university programs.
- Percent funded by Navy has dropped to 42% with 40% of the students, 64% with Marine Corps students.

AGILITY AND RESPONSIVENESS

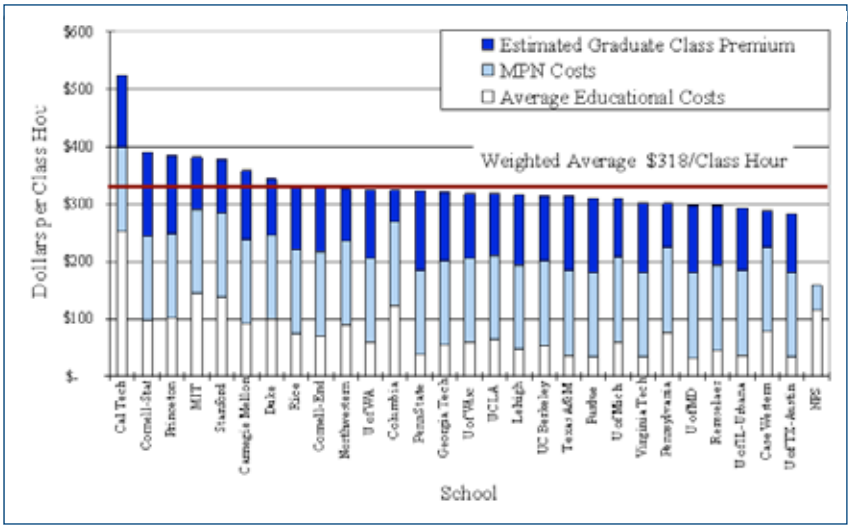
- The nation's ability to respond swiftly and effectively to other such emerging crises will be significantly reduced if the NPS assets are thrown away by an ill-advised decision to close or realign the institution.
- Navy will loose control in dictating how robust and rigorous each curriculum should be.
- It is myopic to believe warfighters sent to civilian institutions will receive the same in-depth NPS education.
- Bluntly put, they will receive an inferior education that the Secretary of Navy has no control over.
- The perception that civilian universities can meet Navy's needs over time is false.

UNIQUENESS

- NPS curriculum is also unique because of the fluid exchange of intellectual capital among students from all four services as well as 300 students from over 60 countries that attend NPS.
  - ~ The King of Jordan, the Turkish Chief of Naval Operation, Chief of Staff of the Israel Air Force and many others are graduates of NPS.
- Unique requirements are levied by Secretary of Navy on naval warfighting graduate education.
  - ~ These requirements are called Educational Skill Requirements (ESRs).
  - ~ They require the NPS student to take a much more in-depth and rounded education than is offered in civilian universities.
    - – Put simply, once every two years a Navy Flag Officer verifies and ensures that every NPS curriculum is the most rigorous and relevant curriculum possible.
    - – Consequently, the same civilian degree does not equal an NPS degree.

COMPARATIVE NPS GRADUATE MILITARY EDUCATION COSTS

Annual costs per student,[1] with adjustments for students' salary/benefits,[2] program duration,[3] transition and refresher courses,[4] course load and contact hours.[5]



[1]Student population is defined as full time equivalent students at NPS; fall enrollment elsewhere.

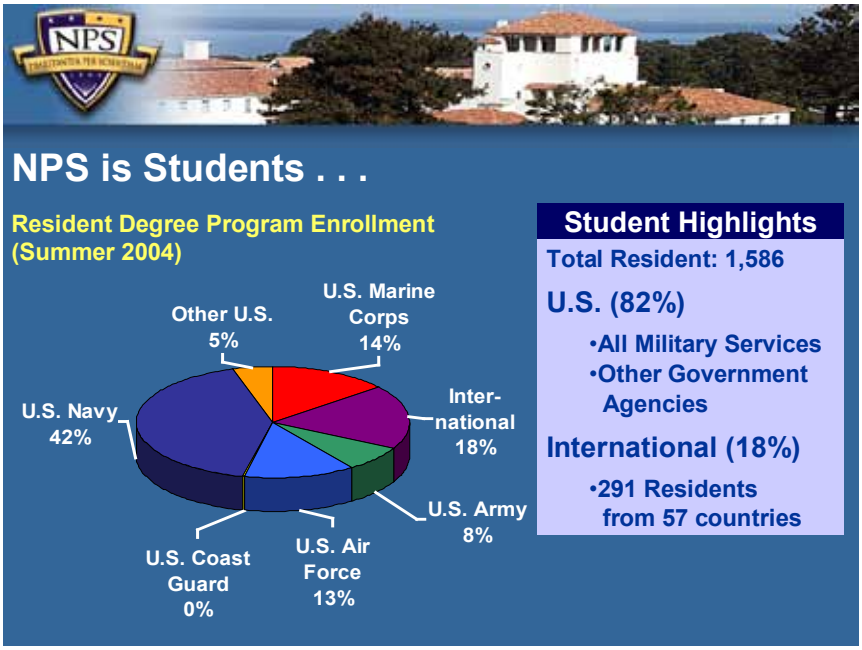
[2]Military Salary and benefits is $63,300/year at NPS; $72,300 elsewhere, reflecting higher off-base housing costs. Program duration is 24 months at civilian universities.

[3]NPS program duration is 22.8 months, including transition and refresher courses.

[4]NPS graduate program duration is 18 months, excluding transition and refresher courses.

[5]Civilian universities include 972 class hours (a 24 month program with 13 class hours/week for 32 weeks during the normal academic year, plus 7 class hours/week for 10 weeks during the summer). NPS program includes 1152 class hours (an 18 month program with 16 class hours/week, 48 weeks/year). The NPS cost per class hour would be the same for the graduate program plus transition and refresher courses (class hours and program costs both increase proportionally).

- Courses of study available at US (civilian) universities are poorly matched with Navy needs.
  - ~ Faculty and students tend toward the exotic and theoretical at the expense of the practical applied sciences needed for naval operations.
  - ~ There is little indication that the Navy



leadership prizes (graduate) education as a necessary component of an officer's background.

WHY IN MONTEREY? PROXIMITY TO GREAT UNIVERSITIES, SILICON VALLEY, MIIS, DLI, QUALITY OF LIFE, OCEAN, RANGES, LLNL PARTNERSHIP, AND ???

- Reasons for why NPS is and should be in Monterey remain much the same as they were when NPS was established. Access to open ocean, access to ranges and uncontrolled airspace and a city that is not a distraction to the officer students.
- If we close NPS and disperse its students to civilian institutions we will lose these unique capabilities and we will never recover them: the faculty who are central to operating this enterprise will migrate to other research universities.
- Moving selected components of the NPS to collocate with other naval facilities will also lead to the loss of most of our research faculty and their unique skills and knowledge.
  - ~ Air, land and ocean facilities that are in use today. Finding other airspace, for example on the East coast, that will allow the 24/7 operation of UAVs at altitudes up to and in excess of 15000 feet will, most likely, be impossible.

GWOT

- Future multinational operations that will be ever more important as we wage the GWOT will suffer if the extensive mutual understanding, trust, and goodwill that results from intensive interactions across this 'global' population of future military leaders are terminated by the closure of NPS.
- A tactical decision to close the School at this critical time in the nation's efforts to increase the supply of defense scientists and engineers would be a failure to recognize the strategic issues involved.
- Afghanistan, Iraq: Training National Guardsmen for their deployments.
- Iraq: Assisting senior Iraqi officials' staff on how best to develop a national security strategy, manage limited resources, and further civilian-military relations.
- Afghanistan, Tajikistan, and Kazakhstan: Enhance U.S. bilateral security cooperation with Central Asian countries by assisting these countries on defense resources and management.
- NPS programs strengthen democratic civil-military relationships in countries throughout the world.
  - ~ National Security decision-making in Indonesia
  - ~ National Security strategy development in Colombia
  - ~ Ministry of Defense reorganization in Taiwan
  - ~ Security Building in Afghanistan
- Homeland Defense and Security graduate program for the Department of Homeland Security, NORTHCOM, and the National Guard.

PERCENT NAVY ENROLLMENT ENROLLMENT MIX

US OFF-CAMPUS PROGRAMS

- NPS offers degrees, certificates, short courses,

web-based, forward presence, e.g., Regional Security Education Program, to over 15,000 students last year.

NAVY'S NEEDS FOR HIGH-TECH

- The Navy has an increasing need for officers who can:
  - ~ comprehend the potential for warfighting that new technologies bring
  - ~ understand both the opportunities and limitations of the new technologies
  - ~ choose among competing technical avenues
  - ~ critically assess and lead technological developments
  - ~ formulate practicable new technological visions
- Technically literate personnel will enable the navy to field more effective fighting units, but the present trend with regard to technical literacy among navy personnel is negative, and sounds the alarm for the desired impact of technology on the Navy in the next 35 years

NEED TO MOVE FROM TRADITIONAL WARFARE TO UNCONVENTIONAL WARFARE

- NPS is leading the way in developing unconventional warfare education that will move the nation into the 21 Century.

RESEARCH

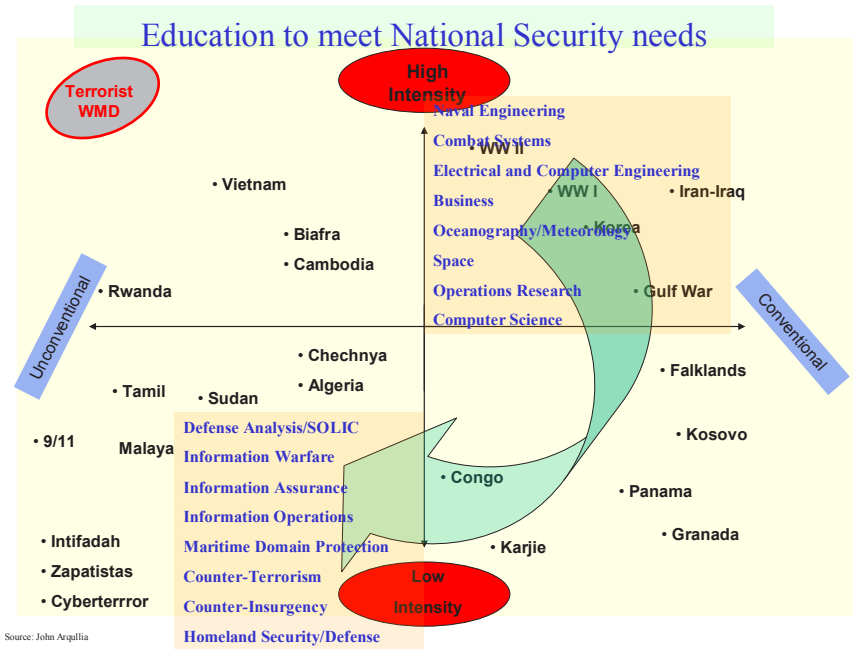
- Immediate access to cutting-edge IT R&D work will be terminated if NPS is closed.
- More generally, the synergistic combination of graduate education in disciplines and curricula critical to the future of our defense establishment with high-impact research in crucial technologies directly relevant to DOD's mission is simply not found in either national laboratories with no capacity or interest in educating military officers or in civilian universities that engage in little or no defense R&D.

ADMISSION OF OFFICERS

- Civilian university admission criteria are a major caveat that must be considered.
- Besides the minimum 3.0 undergrad GPA required for most Tier One schools, the undergrad degree usually is in the same field as the NPS.
  - ~ This is not true of the NPS. For example, 15% of NPS' engineering and science graduates had non-technical degrees at the bachelor's level.
  - ~ There are no Tier One graduate schools that would take non-technical students and admit them into a technical degree programs in the numbers required by the Secretary of Navy.
- NPS converts non-technical warfighters from the fleet into technical graduate students who earn technical degrees and return to the fleet.
- Whereas the NPS metric of effectiveness is to take proven warfighters, sometimes with low GPAs, and recast them as strong technical graduate students; the same students, however, would not gain entry into Tier One schools whose metric of effectiveness is much different and not meant to measure the effectiveness of a proven combat warrior leading people and managing complex weapons systems.
- NPS accepts new fleet warriors each quarter into all of its curriculua. Most civilian institutions are lock-step and if a student does not matriculate in the Fall than they must wait until the following year to start

THE DEFENSE DEPARTMENT HAS A PROBLEM: IT NEEDS TO HIRE MORE THAN 14,000 CIVILIAN SCIENTISTS AND ENGINEERS IN THE NEXT YEAR

- The problem is, the pool of candidates is shrinking.
- More than half of science and engineering graduates from American universities are foreign nationals, who are mostly off limits to federal agencies.
- Fewer American students are entering science and tech fields than in previous years.
- Moreover, DoD must compete with the private



sector and other agencies for that talent and many engineering students aren't even aware jobs await them at DoD.

- Naval Postgraduate School is ninth in the nation in the production of science and technology master degrees.
- NPS is currently producing 18–20 civilian graduates a year to serve in the cyber-corps in all agencies of the government.

The benefits of geographic balance?

Nation's need to Countering Ideological Support to Terrorists

TITLE

The Naval Postgraduate School — It's About Value

AUTHORS

Admiral Henry H. Mauz Jr.
U.S. Navy (Retired), President, Naval Postgraduate School Foundation
William R. Gates, PhD, Associate Professor, NPS

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Naval Institute Proceedings • August 2000

ABSTRACT

In stressing the value of the Naval Postgraduate School, Mauz and Gates illustrate that NPS is "a good return on investment" and calls studies to find alternative means of providing graduate education at less cost "flawed by imbalanced analysis, inadequate research, and preordained outcomes." They compare NPS to civilian universities and show how NPS is far superior. They stress the ability of NPS to quickly adapt curricula to changing needs of all military services, and that NPS is unique in offering naval and defense curricula.

EXCERPTS

"In her July *Proceedings* article, 'Rethinking the Naval Postgraduate School' (July 2000, pp. 46–49), retired Navy Lieutenant Commander Janice Graham offers yet another view. Driven largely by her interpretation of the Department of the Navy's values and objectives for graduate education and a superficial analysis of relative education costs, Commander Graham offers education vouchers, privatization, and outsourcing as alternatives to NPS graduate education. These recommendations seem to reflect the notion that one graduate degree will serve the department just about as well as any other. Nothing could be further from the truth."

"In spite of Commander Graham's assertion to the contrary, there is evidence that most senior leaders in the Department of the Navy place great value on graduate education … With responsive, militarily relevant curricula and a focus on meeting the specific needs of the Navy Department, the Naval Postgraduate School is an invaluable asset."

"A 1998 study by Linda Cavalluzzo and Donald Cymrot compared cost data for postsecondary education in 28 civilian universities and NPS … The average for the 28 civilian universities considered is $268,300. NPS' graduate education costs are $207,200 … As these results show, when data are normalized for the school's unique aspects, the Naval Postgraduate School is cost competitive with civilian universities."

"To put this debate in perspective, consider that the annual budget of the Naval Postgraduate School is less than one tenth of one percent of the Department of the Navy's budget. It produces an overwhelmingly good return on that investment. Even so, the school is not about costs; it is about value."

CD REF NO. PW–3

The Naval Postgraduate School — It's About Value

BY ADMIRAL HENRY H. MAUZ JR., U.S. NAVY (RETIRED), AND WILLIAM R. GATES

Naval Institute Proceedings, 126/8/1,170 (August 2000), pp. 60-63
www.usni.org/Proceedings/Articles00/promauz.htm

The Department of the Navy has been under severe budget pressure for most of the past decade. Shortages in people, parts, maintenance funding, and training opportunities have combined with a multitude of commitments and a high operating tempo to strain our forces. There has been insufficient investment in ships and airplanes, and a tremendous bow wave of requirements looms on the horizon even to maintain the size of today's too-small fleet. It is not surprising that naval leaders are looking for ways to cut costs in all "support" areas, including graduate education.

Graduate education in the Department of the Navy is provided mainly by the Naval Postgraduate School (NPS). The cost of sending students to NPS has been under close scrutiny for some years, to see if funds could be squeezed out for other purposes, and the department has commissioned several studies to look for alternative ways to provide graduate education at less cost. For the most part, however, these studies have been flawed by imbalanced analysis, inadequate research, and preordained outcomes.

In her July Proceedings article, "Rethinking the Naval Postgraduate School" (July 2000, pp. 46-49), retired Navy Lieutenant Commander Janice Graham offers yet another view. Driven largely by her interpretation of the Department of the Navy's values and objectives for graduate education and a superficial analysis of relative education costs, Commander Graham offers education vouchers, privatization, and outsourcing as alternatives to NPS graduate education.1 These recommendations seem to reflect the notion that one graduate degree will serve the department just about as well as any other. Nothing could be further from the truth.

THE VALUE OF RELEVANT GRADUATE EDUCATION

For the Navy, the longstanding "P-Code" system identifies the billets requiring graduate education in specific academic areas, but those billets are almost entirely ashore and mainly in Washington.2 There is a much larger requirement for graduate education than that dictated by the narrow confines of the P-Code system. It seems reasonable, for example, for a few officers serving on board, say, an aircraft carrier or an Aegis cruiser to have had graduate education in an area of practical value to the fleet. Department heads certainly would benefit from graduate work in virtually any curricula offered by NPS. More important, their ships or squadrons would benefit, too.

The Fleets are trying to be more involved in the requirements process, and NPS graduates will be increasingly important to fleet understanding of how systems work and how they are integrated into a larger whole. Upgrades and new systems are being introduced continuously, but few of our end users have the background to understand them fully and use them effectively. We can't offer everyone a graduate education, but our fleet officers ought to be more than just a cadre of "button pushers."

In spite of Commander Graham's assertion to the contrary,3 there is evidence that most senior leaders in the Department of the Navy place great value on graduate education. Facing rapidly changing technology, new missions, and evolving military strategy, they recognize that education is a key to preserving maritime dominance. In fact, the Marine Corps has almost doubled the number of Marine students at NPS in the past several years.

WHAT NPS GRADUATE EDUCATION PROVIDES

The mission and objectives of a Department of the Navy-funded graduate school are clearly specified. With guidance from Title 10 U.S.C., Section 7041-7047, and SecNav Instruction 1524.2A (4 April 1989), the Chief of Naval Operations' "Vision Statement for Graduate Education" (5 May 1999), and its own vision statement (www.nps.navy.mil), the Naval Postgraduate School for more than 90 years has provided graduates able to serve well in a wide variety of coded billets. These graduates have brought their education to the fleet as well, which probably is of even greater value to the services. Besides honing graduates to fill specific jobs, there are other critical characteristics that distinguish NPS from civilian universities:

- NPS provides curricula that are militarily relevant, meeting Navy and Marine Corps subspecialty and general education requirements. Degree programs serendipitously chosen by the officer corps would not match service needs.

- NPS curricula are subject to biennial Navy flag-level sponsor review for military relevancy, with the ability to implement desired course and program changes swiftly.

- Entrance to NPS is controlled by military performance and demonstrated aptitude rather than undergraduate grade-point average and standardized testing.

- NPS provides able and motivated officers the opportunity to transition from one undergraduate area to a different graduate major (unlike industry, the military cannot hire mid-career talent with the desired skill sets; it must educate from within). Astronaut Winston Scott, for example, transitioned from an undergraduate music major to a master's in aeronautical engineering at NPS.

- NPS provides refresher courses to allow students to renew academic skills after several years of on-the-job performance.

- Faculty and students participate in more than 500 research projects per year on issues of interest to sponsoring (funding) agencies from the Department of the Navy and throughout the U.S. government.4

- The NPS student body combines junior officers from the Navy, Marine Corps, Army, Air Force, National Guard, defense agencies, and more than 60 foreign countries to explore technical, operational and strategic problems.

This partnership among students, faculty, sponsors, and foreign militaries produces an unparalleled educational opportunity. There also are important linkages between the Naval Postgraduate School, the geographic commanders-in-chief, and the Fleets. If the Department of the Navy sought to replicate these attributes in civilian universities, it would have to establish Navy and Marine Corps programs under civilian control (with significant augmentation). Naval leaders control these attributes at NPS; they would have to be contractually specified in civilian universities, with questionable results.5

Many of the Postgraduate School's technical and nontechnical fields appear to have civilian counterparts, but NPS curricula have the advantage of being uniquely tailored to satisfy Department of the Navy subspecialty requirements as well as civilian-sector degree requirements and accreditation standards. For example, both NPS and civilian universities offer master's degrees in management, but the NPS programs add defense-specific issues to the general material. Contract management at NPS includes Defense and Navy Department contracting policies, requirements, and case studies. Manpower Systems Analysis addresses the software, data bases, and analytical techniques peculiar to military manpower analysis. There are other examples of synergy, too, such as the National Security Affairs Department being able to draw on the presence of 250 foreign officer students from 60 countries.

NPS is responsive to Department of the Navy and curriculum sponsor direction in ways that may be transparent to the outside observer. For example, at the behest of Vice Admiral Arthur Cebrowski when he was Director, Space, Information Warfare, Command and Control, NPS changed the electronic/information warfare curricula significantly. The school also developed two new 18-month master's programs--Information, Systems, and Operations and Systems Engineering and Integration--specifically designed to meet the needs of unrestricted line officers. Both include joint professional military education. A relatively new 18-month interservice, interdisciplinary curriculum for special warfare officers, sponsored by U.S. Southern Command and initiated under the close scrutiny of its Commander-in-Chief, is very popular with that community. Students also have increasing opportunities to complete phase one of professional military education during their standard NPS tours, taking classes from on-site Naval War College instructors. Finally, NPS is working with Navy sponsors and operational forces to provide distance learning, including both traditional NPS degree courses and graduate-level short courses.6

COST EFFECTIVENESS

Any analysis of cost-effectiveness must first consider educational objectives. If the Department of the Navy validates subspecialty-based curricula, which it has, then the alternatives include maintaining the Naval Postgraduate School, outsourcing, and privatization. If the department were to adopt a general education model, the alternatives would include a restructured NPS and tuition payment to civilian institutions.7

Subspeciality-based Graduate Education. For the government to consider outsourcing or privatization, private-sector graduate education must offer better performance or lower costs, resulting in better value. Office of Management and Budget Circular A-76 emphasizes the need to normalize for differences in outputs when comparing costs between government and commercial producers.

If we attempt to analyze the cost to provide subspecialty-based graduate education, comparing NPS' costs to the existing tuition rates at civilian universities will not provide meaningful data. Endowments and state and local taxes subsidize civilian tuition. Civilian universities likely would view an outsourcing or privatization proposal as a business opportunity that they would enter if profitable; it is unreasonable to think that they have excess endowment funds or tax financing to subsidize Department of the Navy graduate education.8 Thus, an appropriate comparison involves total education costs, given a standardized educational offering.

Unfortunately for purposes of comparison, there are important differences between the Naval Postgraduate School and civilian universities. Unique attributes that increase NPS' average education cost per student per year relative to the standard civilian-sector model include:

- Military-relevant graduate education that satisfies both general education and subspecialty requirements
- Dedication to graduate education (instruction by regular faculty; no teaching assistants)
- Academic scheduling with heavy class loads
- Quarterly admissions with demand-driven course scheduling (courses scheduled to guarantee on-time graduation)
- Required theses in all degree programs
- A military infrastructure superimposed on a traditional academic infrastructure to maintain professional and military aspects of officer-student careers
- Infrastructure to support classified courses, laboratories, and student/faculty research

In addition, the Department of the Navy also pays students' full salaries and benefits while they attend in-residence graduate programs. These costs can be significant, and they are important considerations if graduate programs differ in duration. The most critical adjustments to be made in this area when comparing costs include:9

- Academic Calendar and Course Scheduling. The Navy and Marine Corps want every day of graduate education to count because an officer's time away from the fleet is precious. Thus, the typical NPS student receives 16 hours of instruction per week and attends class 48 weeks per year. This totals 768 hours of instruction per year. In contrast, civilian-sector graduate students typically receive 486 hours of instruction per year, including summer classes, when course selection typically is limited.10
- Dual General Academic and Subspecialty Educational Requirements. The average NPS graduate degree program requires 18 months and involves 1,152 hours of class instruction; civilian universities would require 28 months to deliver an equivalent course content.11
- Focus on Graduate Education. Graduate education is more expensive than undergraduate education. Graduate class sizes are smaller, professors are not supplemented by teaching assistants, and instruction and research require more expensive equipment and specialized laboratories, especially if students must complete master's theses. This is particularly significant for technical graduate programs. One analysis found that graduate education in Washington, Florida, and Illinois was two to three times as expensive as undergraduate education.12
- Student Salaries and Benefits. If NPS and civilian programs are of different duration (e.g., 18 versus 28 months), any cost comparison must include the students' salaries and benefits. The Department of the Navy's Director, Assessment Division, estimated that the annual cost of salary, benefits, and housing per NPS-resident officer totaled $63,300, compared to $72,300 per officer-student at civilian institutions.13 The higher civilian cost reflects the fact that most NPS officers live in base housing.

A 1998 study by Linda Cavalluzzo and Donald Cymrot compared cost data for postsecondary education in 28 civilian universities and NPS. We normalized that data for the effects of NPS' unique academic calendar and course scheduling, dual general education and subspecialty academic requirements, focus on graduate education, and student salary and benefit considerations.14 With these adjustments, the current graduate education costs per master's degree student range from $570,500 (California Institute of Technology) to $208,400 (University of Texas at Austin). The average for the 28 civilian universities considered is $268,300. NPS' graduate education costs are $207,200--lower than all the civilian institutions considered. Student salaries and benefits are included in these figures and account for anywhere between 25% and 70% of the totals, with an average of 53%.

As these results show, when data are normalized for the school's unique aspects, the Naval Postgraduate School is cost competitive with civilian universities. It is unlikely, therefore, that the total costs of in-residence subspecialty-based graduate education for the Department of the Navy would be reduced by outsourcing or privatization. In fact, NPS would look even more cost-effective after adjusting for other cost-related unique attributes.15

This result is counter to the conventional view that annual costs per student are greater at NPS than at civilian institutions. The primary explanation for this difference is workload. Because annual student workloads are approximately 60% higher at NPS than at civilian graduate programs, and because higher student workloads use faculty more intensively, the average annual cost per student is increased. But the length--and thus ultimate cost--of a standardized degree program is reduced considerably.

General Graduate Education. If the Department of the Navy were to adopt a general education objective, comparing current costs at the Naval Postgraduate School to tuition rates at civilian institutions still would be meaningless. NPS' costs reflect subspecialty-based graduate education; to compare NPS costs with civilian institutions would require first defining a general education curriculum structure at NPS. This is beyond this article's scope, but we offer some observations.

On the surface, cost-effectiveness of general graduate education at NPS is unlikely to compare favorably with tuition costs at civilian institutions. This is because tuition covers only a portion of educational costs at civilian universities--endowments and tax financing fund the balance.16 The Navy Department, on the other hand, must pay all educational costs at NPS. This disadvantage would be offset to some extent by NPS providing more class hours per year and by flexible admissions timing. Returning students to the fleet more quickly reduces the associated student salary and benefit costs by up to 40%.

In addition, NPS admits students based on militarily relevant requirements. Civilian universities consider undergraduate academic records, standardized test scores, and, in some cases, relevant professional experience. Civilian admissions committees also balance the demographic characteristics of their incoming classes. The prestigious programs often suggested as alternatives to NPS are not undersubscribed by civilian students. Thus, they likely would limit admission to a very few of the most qualified Navy and Marine Corps students. This would create problems for the Department of the Navy as it seeks quality civilian education for large numbers of service members. Of course, marginal schools that struggle to maintain enrollment would welcome large groups of Navy Department students willing to pay full tuition, but we should carefully consider the resulting tradeoff between cost and educational quality. Civilian universities are ranked on excellence of education, not on costs. Why should the Navy Department's university be ranked otherwise?

A GOOD RETURN ON INVESTMENT

The Department of the Navy's objective for the Naval Postgraduate School is to provide technical, analytical graduate education in a variety of subspecialty areas not available in civilian universities. General graduate education emphasizing entrepreneurial skills, public speaking, debate, and better business practices simply does not meet the naval services' need. NPS includes this material in its curricula, but it specializes in developing and applying technology, knowledge, and intelligence to managing future security crises and wars, serving all military services and more than 60 foreign countries. NPS quickly adapts curricula to the sponsor's changing needs, and its programs are well regarded by the nation's higher educational community and highly valued by their curriculum sponsors, by commands receiving its graduates, and by foreign governments. Although many civilian institutions offer graduate education, none provide it with the unique naval and defense characteristics that the Naval Postgraduate School offers.

Commander Graham's article does highlight the importance of providing more visibility to the great national resource that is the Naval Postgraduate School. If the school were better understood by some of the budget-cutters in Washington, there

would be greater recognition that it produces the essential seed corn of tomorrow's educated officer corps and is cost-effective in the process.

To put this debate in perspective, consider that the annual budget of the Naval Postgraduate School is less than one tenth of one percent of the Department of the Navy's budget. It produces an overwhelmingly good return on that investment. Even so, the school is not about costs; it is about value. NPS graduates will have a significant positive impact on the future of the Navy and Marine Corps. In fact, both services would be well served to examine more closely their requirements for graduates to serve afloat and ashore, and increase the number of students at NPS accordingly. All the studies in recent years, and the related discussion of realignment, relocation, outsourcing, privatization, and so on, have had a corrosive effect on the school, its faculty, and even the students. Let's hope those studies have run their course. It's time to get on with graduate education at the Naval Postgraduate School.

NOTES

1. Commander Graham states, "Initial forays to several top-tier private universities for the purpose of determining their interest in some type of partnership with NPS were most promising." She does not provide any reference for this assertion, list the universities contacted, or describe the ground rules specified (student/faculty workloads; admissions timing, curriculum content and review; etc.). As such, it is difficult to determine the actual interest level in such partnerships.

2. Commander Graham reports that only 20-25% of NPS graduates filled matching P-coded billets in the six years following graduation. The primary reference is Linda C. Cavalluzzo and Donald J. Cymrot, "A Bottom-Up Assessment of Navy Flagship Schools," CRM 97-24, Center for Naval Analyses, January 1998, p. 111. More detailed data in this report (pp. 61-62) indicate that "exact matches" within six years equaled 54% and 30% in the restricted line and unrestricted line communities, respectively. Utilization rates after six years for a qualifying payback tour (exact, closely related, or other qualifying match) were 91% and 67%, respectively.

3. See also Cavalluzzo and Cymrot, "A Bottom-Up Assessment."

4. This reflects fiscal year 2000 reimbursable research program as of 1 June 2000.

5. Civilian universities are unlikely to develop/deliver military-unique material, or the other attributes NPS offers, if DoN students simply pay civilian tuition rates.

6. This is consistent with SecNav Instruction 1524.2A, which states: "The objectives of graduate education at the NPS are to prepare officers to fill subspecialty positions. . . . Graduate degree and nondegree (short courses) programs in technical and nontechnical fields shall be established by the Superintendent of the NPS in response to Navy and Marine Corps requirements."

7. Restructuring NPS into fewer, broader curricula would increase the emphasis on general education while retaining some focus on DoN- and DoD-specific issues. Sending students to existing civilian programs would mean losing all focus on DoN/DoD issues unless the programs were augmented by Navy-funded material.

8. Civilian universities would share their endowments only if they enter outsourcing or privatization agreements out of a sense of public service, not as business opportunities.

9. For a more complete discussion see William R. Gates, Xavier K. Maruyama, John P. Powers, Richard E. Rosenthal, and Alfred W. M. Cooper, "A Bottom-Up Assessment of Navy Flagship Schools: The NPS Faculty Critique of CAN's Report," NPS Technical Report NPS-FC-98-001, November 1998, pp. 11-22.

10. NPS' heavier academic load makes sense because the Navy and Marine Corps pay these students full salary and benefits; graduate students at civilian universities may need a lighter load to allow time for employment or other pursuits.

11. Cavalluzzo and Cymrot, "A Bottom-Up Assessment." Alternatively, NPS and civilian university costs could be scaled to a 972-class-hour civilian graduate program. Relative costs are the same in either case; only the scale differs. Commander Graham asserts that NPS' dual educational requirements increase degree program length; however, its more intensive academic calendar allows NPS to satisfy dual education requirements without extending the graduate program length. Transitional and refresher courses have a greater impact on program length. These classes reflect Navy policy allowing students to enter NPS in fields outside their undergraduate majors. This flexibility is essential considering the Navy's closed-pipe personnel system that precludes mid-career accessions in areas of Navy need.

12. Peter D. Syverson and Moira J. Maguire, "Estimating Institutional Costs of Graduate Education:

Reports from Three States Demonstrate Promise, Pitfalls of Cost Studies," Council of Graduate Schools, 1997.

13. "Memorandum for the Deputy Chief of Naval Operations (Resources, Warfare Requirements and Assessments)," Ser N81/3U639949, 29 March 1993.

14. Detailed calculations are described in Gates et al., "A Bottom-Up Assessment."

15. For example, quarterly inputs and class scheduling to ensure on-time graduation reduce class size; maintaining military infrastructure increases administrative costs; and the thesis requirement increases faculty costs.

16. Tuition covers 13%-73% of educational expenditures in the civilian sample described above (Cavalluzzo and Cymrot, "A Bottom-Up Assessment," p. 69).

Admiral Mauz is president of the Naval Postgraduate School Foundation. Before retiring from active duty in 1994, he was Commander-in-Chief, U.S. Atlantic Fleet. Dr. Gates is an associate professor at the Naval Postgraduate School. He received his Ph.D. in economics from Yale University. Prior to joining NPS, he worked as an economist at NASA's Jet Propulsion Laboratory and as a consultant to the Rand Corporation.

TITLE

Military Value Analysis

SOURCE

Technical Joint Cross Service Group Analyses and Recommendations (Volume XII) 19 May 2005

SUBTITLE

Technical Joint Cross Service Group (JCSG) Base Realignment and Closure (BRAC) Report for BRAC 2005 under Ronald M. Sega, Director of Defense Research and Engineering

ABSTRACT

The Naval Postgraduate School was rated high by the BRAC Technical Joint Cross Service Group (TJCSG) when they examined 146 technical facilities regarding their value to defense RDT&E. The report identifies the most important 13 technical areas in developing military strength, then evaluates each technical facility over three functional areas: research, development and acquisition, and test and evaluation.

EXCERPTS

"Each of the DoD technical facilities was awarded a Military Value score for each of the resulting 39 categories. While NPS received a score in many of these areas, this report concentrates only on our results for the 13 'Research' categories. However, it should be noted that NPS was rated the number one technical facility in the category: Battlespace Environments D&A."

"NPS received its highest rating (top 5%) in Information Systems, while its overall ranking was in the top third on average. This result clearly demonstrates the breadth, importance, and quality of our research program."

"The TJCSG identified four major multidisciplinary laboratories as consolidated Defense Research Laboratories: Aberdeen Proving Ground, MD, Naval Research Laboratory, Washington DC, Wright-Patterson AFB, OH. NPS clearly represents a fourth multi disciplinary research asset that should be recognized as a major contributor to developments in defense R&D."

CD REF NO. PW–4

Area	NPS Mil Value Ranking
Air Platforms Research	14 of 35
Battlespace Environments Development & Acquisition	1 of 21
Battlespace Environments Research	3 of 25
Biomedical Research	23 of 30
Chemical & Biological Defense Development & Acquisition	32 of 40
Chemical & Biological Defense Research	10 of 42
Ground Vehicles Research	13 of 24
Human Systems Development & Acquisition	17 of 87
Human Systems Research	13 of 65
Information Systems Development & Acquisition	66 of 105
Information Systems Research	4 of 68
Materials & Processes Research	18 of 46
Nuclear Technology Research	4 of 15
Sea Vehicles Research	11 of 36
Sensors, Electronics & Electronic Warfare Development & Acquisition	39 of 103
Sensors, Electronics & Electronic Warfare Research	20 of 68
Space Platforms Research	10 of 26
Weapons and Armaments Research	24 of 60

TITLE

White Paper: Naval Postgraduate School

AUTHOR

CDR Porter • 20 Mar 05

ABSTRACT

In a memorandum dated 4 Jan 2005 from Acting Under Secretary of Defense Michael W. Wynne, he cites cost as the fourth criteria in selecting military installations for closure or realignment. This paper proves that the Naval Postgraduate School is cost-effective and is a valuable asset. Other NPS values include its unique military curricula, high academic standards, and faculty with extensive defense-related experience.

EXCERPTS

"Judging by the priority of the Under Secretary's criteria cited above, it is recognized that cost savings is only one consideration of military value in deciding whether to close or realign an installation. In the case of the Naval Postgraduate School, to make a closure decision primarily on cost considerations is to miss the very essence of what the school represents operationally, academically, and intrinsically to the Navy and to the Department of Defense."

"NPS may be one of our best tools to ensure the alignment of advanced operational concepts and technologies among the Department of Defense, Homeland Security, interagency, and international military partnerships. Rather than considering closure of NPS, we should be focusing on how to better maximize the return on our investment. These rewards could well include our Navy's preeminence in educating and retaining the most technologically advanced warfighters in the world, both officer and enlisted, and our military's assured superiority in Joint and coalition warfare for generations to come."

"An August 2000 article in "Proceedings" magazine titled, "NPS: A Case for Value," provided a comparison of the costs associated with a degree earned from NPS and a similar degree earned from a comparable civilian university … a civilian course of study almost certainly does not represent the same tailored, defense-centric, militarily career-enhancing curriculum provided by NPS. This is a crucial flaw inherent in any cost comparison. Because, in fact, curricular requirements at NPS include Educational Skill Requirements (ESRs) dictated by the Secretary of the Navy that are intended to broaden the military student's educational experience."

"Other studies completed recently estimate the average cost of a graduate degree from a civilian university to be approximately $27,000 per academic school year (9 months) … Hence, based on the 24–28 months required to earn a Master's degree at a civilian university, without meeting Educational Skill Requirements, it is fair to estimate total tuition fees of approximately $72,000 (2.6 x $27K). An academic school year at NPS (12 months) was recently estimated to cost approximately $36,000."

"NPS is vital to DoD's interaction with other agencies and nations for national security. As has been shown, NPS programs strengthen democratic civil-military relationships in countries throughout the world. The "National Defense Strategy" plainly proclaims a goal fully supported by the Naval Postgraduate School, 'We seek to foster a culture of innovation.'"

CD REF NO. PW–5

White Paper: Naval Postgraduate School

THE ABILITY OF OUR OFFICER AND ENLISTED LEADERS TO ANTICIPATE AND MANAGE THE CHALLENGES OF TOMORROW IS ONLY LIMITED BY OUR FORESIGHT TODAY

OVERVIEW

In his Memorandum dated 4 Jan 2005, Subject: 2005 Base Closure and Realignment Selection Criteria, Acting Under Secretary of Defense (Acquisition, Technology, and Logistics) Michael W.Wynne stated the following:

"In selecting military installations for closures or realignment, the Department of Defense, giving priority consideration to military value (the first four criteria below), will consider:

MILITARY VALUE

1. The current and future mission capabilities, and the impact on operational readiness of the total force of the Department of Defense, including the impact on joint warfighting, training, and readiness.
2. The availability and condition of land, facilities, and associated airspace…
3. The ability to accommodate contingency, mobilization, surge, and future total force requirements at both existing and potential receiving locations to support operations and training.
4. The cost of operations and the manpower implications.

Other considerations cited in the Under Secretary's Memorandum included the extent and timing of potential costs and savings, the economic impact on existing communities in the vicinity, the ability of infrastructure of both the existing and potential receiving communities to support forces, missions, and personnel, and the environmental impact.

Judging by the priority of the Under Secretary's criteria cited above, it is recognized that cost savings is only one consideration of military value in deciding whether to close or realign an installation. In the case of the Naval Postgraduate School, to make a closure decision primarily on cost considerations is to miss the very essence of what the school represents operationally, academically, and intrinsically to the Navy and to the Department of Defense. And yet inevitably, this is the first criterion examined and, perhaps, the one most heavily weighted in the decision process. Despite the fact this does not seem in keeping with the Under Secretary's guidance, and as I hope to prove, would lead to the conclusion that closing NPS would be a costly mistake, such an approach runs the risk of overlooking the TRUE value of the institution…one that has been named an Information Operations Center of Excellence by the Deputy Secretary of Defense, the Center of Education Excellence by the Commander of NETWARCOM, the U.S.'s only NATO Partnership for Peace Education and Training Center by former Secretary of State Colin Powell, and a "national treasure" by GEN John Abizaid, COMCENTCOM.

The Naval Postgraduate School represents the center of gravity of the US Navy's education strategy and is a critical enabler in DoD's Transformation, our own Human Capital Strategy, Sea Power 21, and the War On Terrorism. NPS may be one of our best tools to ensure the alignment of advanced operational concepts and technologies among the Department of Defense, Homeland Security, interagency, and international military partnerships. Rather than considering closure of NPS, we should be focusing on how to better maximize the return on our investment. These rewards could well include our Navy's preeminence in educating and retaining the most technologically advanced warfighters in the world, both officer and enlisted, and our military's assured superiority in Joint and coalition warfare for generations to come.

We can't afford to build tomorrow what we have today!

OUR INITIAL INVESTMENT

Originally established as a postgraduate department of the US Naval Academy almost 100 years ago, the Naval Postgraduate School moved to its current location in Monterey, California in 1951. The main campus is situated on 135 acres along Pacific Coast Highway that were originally purchased for $660,372 as part of a 627 acre buy. Today, NPS holdings include 620.5 acres, the original cost of which totaled $1.3 million. The scenic location of this property and its proximity to other area academic institutions (Stanford University, University of California, Berkeley, University of California, San Jose, Defense Language Institute), as well as Silicon Valley's powerful technological epicenter, make it difficult to appraise its current monetary value. But the intrinsic value of the location cannot be overstated in drawing some of the nation's brightest defense research professors, serving as a powerful incentive for junior and mid-grade officers (and perhaps one day for degreed enlisted leaders as well) to continue their service, and providing an a idyllic glimpse of America for international students from over 60 countries.

Operationally, NPS' holdings in Monterey provide access to open ocean, ranges and uncontrolled airspace (as well as to a city that is an inspiration vice a distraction for students). If we close NPS, and disperse the students to civilian institutions or other military installations, we will lose these unique capabilities and we will never recover them. Our research faculty will likely migrate to other research universities taking with them unique skills and knowledge. In fact, finding other airspace, at an installation on the East coast for example, that will allow the 24/7 operation of UAVs at altitudes up to and in excess of 15000 feet will, most likely, be impossible.

OPERATING COSTS

In 2002 total expenditures/operating costs amounted to $314.5 million (37% of which covered student salaries, 21% went to research). This was balanced by a budget of $314.5 million which included $129.3 million for student salaries, $80.6 million for reimbursable academic costs, $48.8 million for direct academic costs, $27.4 million for direct base operations, $17.7 million for reimbursable base operations, $9.7 million for military staff salaries, and $1 million for NAF. In 2003, sponsored program reimbursable expenditures (which include Research, Education, and Service Programs) exceeded $66 million, a 15% growth from FY02 (ranked by the National Science Foundation among the top 25% of institutions in total R&D expenditures). In 2004, $184 million of expenses (not including student salaries) were covered by $184 million total funding. This included Navy direct funding for $74 million (covering 40%) and reimbursable funding for $109 million (60%).

In attempting to compare apples to apples we miss the core differences!

A COMPARATIVE ANALYSIS

An August 2000 article in "Proceedings" magazine titled, "NPS: A Case for Value ," provided a comparison of the costs associated with a degree earned from the Naval Postgraduate School and a similar degree earned from a comparable civilian university. I have highlighted the word, here, because "similar" though the degrees may be when displayed on a sheepskin, and surely just as challenging in their pursuit, a civilian course of study almost certainly does not represent the same tailored, defense-centric, militarily career-enhancing curriculum provided by NPS. This is a crucial flaw inherent in any cost comparison. Because, in fact, curricular requirements at NPS include Educational Skill Requirements (ESRs) dictated by the Secretary of the Navy that are intended to broaden the military student's educational experience. For instance, NPS provides JPME coursework on campus from dedicated War College faculty, so that officers can satisfy both their masters and joint military requirements during a single tour. Additional coursework is also required to ensure the student appreciates the military relevance of the academic subject material, thereby enabling immediate application upon rejoining the operational force. Hence, additional credit hours of instruction are built into NPS curricula to meet ESRs. Similar courses are not available at civilian universities and represent a hidden, but necessary, cost in NPS' budget.

Another "core" difference that must be acknowledged as part of any comparison is that civilian university admission criteria can not be trivialized. Besides the minimum 3.0 undergrad GPA required for most Tier One schools, and a requirement to do well on a graduate entrance exam (e.g. GRE), graduate students are usually accepted for admission in the same field of study in which they received their undergraduate degree. This is not the case at NPS whose mission includes converting non-technical warfighters from the fleet (some of whom had relatively low undergraduate GPAs or have been away from academia for a number of years) into graduate students capable of earning technical degrees and applying this expertise in a highly complex operational environment. For example, 15% of NPS' en-

gineering and science graduates had non-technical degrees at the bachelor's level. The truth is that many NPS students would not gain entry into Tier One schools whose entrance criteria are not meant to consider the attributes of a combat warrior with proven leaderships skills, capable of managing complex weapons systems (a review by civilian universities of 300 Navy officers enrolled at NPS revealed they would admit only 12% directly and 13% with additional courses). No Tier One graduate schools would take non-technical students and admit them into technical degree programs in the numbers required by the Secretary of Navy.

Further, each quarter NPS accepts new military students into its curricula. Most civilian institutions, on the other hand, work on a fixed academic calendar, so that if a student does not matriculate in the Fall, they cannot be admitted until the following year. Bearing operational demands in mind, particularly during this time of war, this loss of scheduling flexibility would have a significant impact on the number of military students capable of accommodating such a restrictive admission policy. But in an attempt to provide an "apples to apples"comparison, we must focus our attention on a more profound difference between NPS and civilian universities that has a significant impact on the cost of earning a degree.

The academic ops tempo at NPS is significantly greater than that of a traditional civilian university. At NPS, the academic school year is based on four,twelve week quarters consisting of 16 classroom hours per week. Although academic calendars vary at civilian universities, typically students attend classes 13 hours a week for 32 weeks of the year, and may attend a ten week summer term for seven hours a week. This amounts to approximately 58% more student-faculty contact hours per academic year at NPS than at a typical civilian university. Carrying this line of reasoning out to its logical conclusion, the "Proceedings" article demonstrates that a student at NPS would conclude his Master's degree coursework in approximately 18 months, or 6-10 fewer months than would have been required at a civilian university.

A recently updated version of this original article estimates the "cost" per credit hour at NPS by using the FY02 Operating Budget and the average number of students on board that year. The total instructional cost is calculated by adding the direct academic cost ($48.8 million) to the fraction of direct base-operations costs attributable to non-reimbursed academic functions ($27.4 million times 48.8/185.2, which is the total expenditures minus $129.3 million in student salaries) for a total of $56,019,869. By dividing this total instructional cost by the average number of students on board in FY02 (1336), and by 64 credit hours per year (16 per quarter), the cost per credit hour at NPS is calculated to be $655. This number compares to an average of $724 at 11 peer institutions (including Cal Tech, Carnegie Melon, Georgia Tech, Illinois Institute of Technology, MIT, NC State-Raleigh, Purdue, Rensselaer Polytechnic, Rice, Rochester Institute of Technology, and USC). At $655 per credit hour, NPS ranked seventh among these universities. However, the point of this exercise was to demonstrate the difference in cost over the duration of coursework needed to earn a degree.

Returning to our initial assertion, we'll recall that based on a more aggressive academic calendar, an NPS student could earn a degree (requiring 96 credit hours) in 18 months vice the 24-28 months that would likely be required to complete 96 credit hours of coursework at a civilian university. Therefore, to compare the costs of a degree, six to ten additional months of the student's military salary would have to be added to the nominal tuition fee at a civilian university. Based on these calculations, a degree at NPS would clearly cost the government less than the average cost associated with the 11 other peer universities cited above.

Other studies completed recently estimate the average cost of a graduate degree from a civilian university to be approximately $27,000 per academic school year (9 months). Bearing in mind that tuition represents only a fraction of total costs (70-80% of the total costs at a civilian university are compensated by state, federal, or private endowments and research), we must consider the points made above regarding credits contained in one academic year at a civilian university. Hence, based on the 24-28 months required to earn a Master's degree at a civilian university, without meeting Educational Skill Requirements, it is fair to estimate total tuition fees of approximately $72,000 (2.6 x $27K). An academic school year at NPS (12 months) was recently estimated to cost approximately $36,000. But, again, based on the more rigorous academic calendar at NPS, a degree would take only 18 months to earn (excluding an estimated 4.8 months additional time required for transition and refresher courses). Even by adding the costs associated with the additional 4.8 months (which would not include a full academic load), a student would earn a tailored degree, would produce a defense-related thesis, and would meet all Educational Skills Requirements in under two years, for less than $72, 000 (< 2 x $36K).

It should be noted that this cost comparison did not consider varying housing allowances from region to region. Therefore, drawing the conclusion from the analysis cited above that the cost of a similar degree at a comparable civilian university would be signifi-

cantly higher than at NPS, another cost analysis is suggested: how much would be saved by moving NPS to an existing military installation in a less expensive geographic area? It could be argued that the same rigorous academic calendar would be in place, so that not only would the degree be completed in the same amount of time as currently done at NPS, the cost of living would be lower for the student and his or her dependents. But here, I return to an earlier point: making a closure, or realignment, decision primarily on cost considerations is to miss the essence of what NPS represents operationally, academically, and intrinsically to the Navy and to the Department of Defense.

Operationally and intrinsically, Naval Postgraduate School is a model environment for military academic excellence and a showcase of American values for international students. It should serve as an incentive for our best and brightest officers and enlisted personnel who seek graduate degrees to enrich and enhance their military careers and improve their post-career job prospects as well (in fact, many of these students should be encouraged to pursue defense-related employment upon retirement from the service, thereby bringing their extensive military experience and graduate education into government or private sector defense-related fields). NPS also imprints a strong positive impression of America and our military on international students, many of whom will go on to be senior leaders, with considerable influence, in their own militaries. Fond memories of NPS and the friends with whom they studied there will pay further dividends on our investment through stronger collective security partnerships in the future. The King of Jordan, the Turkish Chief of Naval Operations, and the Chief of Staff of the Israeli Air Force are among the international alumni of NPS.

The location of NPS adds intrinsic value to the school and increases the potential return on our initial investment. While the cost of operating a military postgraduate institution in a less costly economic area than Monterey would probably save money in housing and some direct operating costs, what would be the second and third order effects of such a move? Would a school in a less attractive and academically dynamic environment draw research academicians with degrees from the same prestigious universities as are represented today by the faculty of NPS (among tenured track faculty, terminal degrees are held by three or more faculty members from Stanford, MIT, Harvard, Yale, Purdue, Princeton, Penn State, Cornell, Northwestern, Rensselaer, The University of California system, and more)? Further, what would be the impression of a less attractive and culturally stimulating environment on our international students? And perhaps most importantly, what message would this send our Navy family, who so often trades inconvenience and quality of life for the opportunity to serve? The postgraduate experience should be enriching both academically and socially. With the capital investment we have made in Monterey, California we can offer the finest quality of life for our students and their families as an indication of our commitment to them and to their futures. They will repay us with their energy, resourcefulness, and innovation.

And finally, hypothetically, what if we could find a civilian university willing to offer a degree in an accelerated timeframe so that we could avoid paying the additional costs associated with a "typical" civilian academic regime? While a civilian university might come close to equaling some of the intrinsic value associated with NPS, the vital operational aspects of the curriculum (including the Educational Skills Requirements) would be missing. Professors would generally not have the extensive defense-related experience common among the NPS faculty, nor could they be expected to demonstrate military applications of their subject matter. Student/faculty contact hours would be less (NPS was ranked near the top of the 11 peer universities mentioned in this category) since civilian universities routinely use graduate assistants to teach some graduate-level courses, and university research would not be 85% defense-related as it is at NPS. The academic environment, while perhaps representing a refreshing change for military students, would tend to take minds away from the challenging operational applications of their course of study. In fact, the opportunity to work with other service members and with international military students would be largely lost. As would the ability to introduce foreign officers to a challenging and enriching glimpse of what their military futures could hold. The return on investment in sending military students to civilian universities for the United States Navy and program sponsors would be far less then it is in the defense-centric environment at NPS.

If our task was to design a graduate university to prepare America's young military leaders for the dynamic challenges and opportunities of a vastly different tomorrow it would be joint and international, have diverse defense and interagency related curricula, be held to the highest academic standards, taught by professors experienced in advanced military research. It would be cost-effective and offer the highest level quality of service needed to draw and keep our best…

NPS IS THIS AND MORE…

While enrollment fluctuates somewhat throughout the academic year, in the summer of 2004, the NPS student body was comprised of 42% Navy, 14% Marine Corps, 13% Air Force, 8% Army, 5% other US agencies, and 18% international students (291 residents from 57 countries). By 2006, 1800 military officers, defense civilians, enlisted, defense contractors, and other agency representatives from the United States and other nations will be studying in resident programs at NPS. Another 4,000 or more students will be enrolled in degree or certificate programs around the world.

Joint

NPS works closely with the Unified Combatant Commanders to provide relevant education and research critical to the combat mission. NPS faculty provides about $75 million of research to the Navy, Unified Combatant Commanders and the Services. Examples of support to the Combatant Commanders in 2002-2003 included:

- Homeland Defense and Security programs for Northern Command and Pacific Command.
- Counterterrorism programs in support of Unified Combatant Commanders' initiatives.
- NPS faculty and students' direct support to Millenium Challenge 02 for Joint Forces Command.
- A Special Ops curriculum and related research on UAV's, tactical decision aids, and other warfighting advances for SOCOM.
- Information Security for Strategic Command.
- Graduate education for National Guard division staffs deploying to European Command (and NATO) op areas.

International

The Center for Civil-Military Relations (CCMR) at NPS is dedicated to strengthening democratic civil-military relationships and assisting other nations in making integrated defense decisions. Courses are offered across the country, overseas, and in-residence. Each quarter, CCMR runs 20 to 30 events in more than 20 nations, reaching over 8000 civilian and military personnel each year. From October through December 2004, CCMR held 25 events, both in residence and non-residence, teaching civilians and military from 28 nations, including Azerbaijan, Slovenia, Latvia, Bosnia, Kosovo, Romania, Columbia, Fiji, and others. These events ranged from two-day site visits to two-week seminars. Naval Postgraduate School professors and instructors taught these courses/seminars.

The Leader Development and Education for Sustained Peace (LDESP) program is a component of CCMR. This graduate-level education program serves the education needs of professionals from various disciplines and/or agencies such as ambassadors, former political officials, former military commanders, security and international law enforcement personnel, community leaders, and United Nations and State Department personnel. LDESP prepares units deploying to stability operations in Central Europe, Central Asia, the Middle East and Africa. Recent activity (late 2004) focused on preparing senior leaders/U.S. units for their deployments to Iraq, Afghanistan, and Kosovo.

The Defense Resources Management Institute (DRMI) is an educational institution sponsored by the Secretary of Defense and located at NPS. Since 1965, DRMI has conducted professional education programs in analytical decision-making and resource management for military officers of all services as well as senior civilian officials from the United States and 125 other countries. The courses can be studied either overseas or in-residence. The principal focus of all DRMI programs is to develop an understanding and appreciation of the concepts, techniques, and decision-making skills related to defense resource management. The emphasis is not on training in job-specific skills, but rather to understand the concepts, techniques, and issues that pervade defense resources management decision-making.

In 2004, DRMI's Mobile Education Team (MET) held courses in: Macedonia, Guatemala, Honduras, Argentina, Thailand, Tajikistan, Malaysia, Belize, Lithuania and Bosnia. In 2005, DRMI's MET plans to hold courses in: Guinea, El Salvador, Columbia, Honduras, Bangladesh, the South Pacific, Indonesia, Malaysia, Mexico, Estonia, Argentina, Canada, and Latvia.

Interagency, National Security

NPS provides specialized programs that support U.S. national security priorities, including counterterrorism, homeland security, and security cooperation. Master's degree programs and seminars have been developed on Homeland Defense and Security, as well as Counter-drug Strategy and Policy, for the Department of Homeland Security (and for the Chief of Naval Operations, NORTHCOM, and the National Guard). NPS teaches a classified graduate education program for the National Security Agency, is a University of choice for the National Reconnaissance Office, and NASA sponsors the annual Michael J. Smith NASA Chair at NPS with focused areas of space research, education and training for future astronaut candidates. Additionally, NPS receives sizeable annual funding from the National Science Foundation for basic research in oceanography, meteorology, information sciences, engineering, and technology development, often partnering

with other universities on interdisciplinary research projects.

"Prevail today while bridging to a successful future." CNO Guidance for 2005

NPS IS THE BRIDGE TO…

"Refined Operational Concepts to deliver the kind of dominant military power from the sea envisioned in Sea Power 21." Operations Logistics faculty and students are conducting research on how to use of High Speed Vehicles (HSVs) in a logistics role for CTF-73 and how to modify contingency support plans. Twenty Systems Engineering and Analysis students are leading a campus-wide integrated study on defeating maritime terrorism and pirate-supported terror in the Southeast Asian waterways; NPS students from Singapore will be integrated into this study. Thirteen Systems Engineering and Analysis students will lead a campus-wide integrated study on the challenges of Undersea Warfare in the Littoral. This work will focus on the most relevant threats and will involve coordination with COMPACFLT, ASW Command, and TF ASW. The estimated completion date is December 2005.

"Alignment to best organize our personnel and resources across the Navy to support the Fleet, training and education of our personnel, and the synergies of our various echelon levels." NPS' Regional Security Education Program (RSEP) raises the strategic situational awareness of deploying and forward-deployed naval forces, thereby enhancing force protection and mission performance. The RSEP sends teams of regional security experts to ships and forward bases where they brief unit personnel on the strategic, political, and cultural contexts in which they will operate. RSEP teams typically remain on site for several days where they conduct briefings as well as informal discussion sessions. An RSEP team was onboard the Lincoln Strike Group as they deployed to the Persian Gulf, where the team provided staff and crew with counter-terrorism and Middle Eastern political, military, and regional orientation.

"Sea Trial to increase levels of operational, organizational and technological agility." Students in the Systems Engineering and Analysis curriculum completed a nine-month study of Sea Basing and Joint Expeditionary Logistics for the 2015 to 2025 time frame. The integrated multidisciplinary project was completed by a team of 50 students and 20 faculty from across campus including the Systems Engineering Analysis and Total Ship Systems Engineering curricula. One student helped develop a prototype map-based system to automatically display, animate, and statistically analyze situation reports about insurgent activity (including Improvised Explosive Device or IED attacks) from Operation Iraqi Freedom. The student applied statistical process control techniques developed by his thesis advisor and XML technology developed by his second reader to display and analyze SIGACT data, providing early warning of shifting enemy patterns.

"Sea Enterprise to increase the pace of innovation throughout our Navy." NPS has been a leader and an active participant in the Navy's efforts to develop future naval technologies. NPS researchers took part in the Silent Hammer exercise that tested submarine control of a long-endurance UAV to support forces on land, and NPS physicists have conducted pioneering research on shipboard free electron lasers and electromagnetic rail guns while guiding student thesis research on these topics in order to develop military leaders familiar with these future technologies. In another thesis, a student created a theater ballistic missile defense (TBMD) operational planning aid that helps the Area Air Defense commander create courses of action to best locate TBMD assets. The model, JOINT DEFENDER, which can also be used in programmatic development for evaluating cost/benefit of new technologies, has been briefed to NWDC, CNO N-76 and STRATCOM and is being evaluated for inclusion in a standard suite of TBMD models.

"Sea Warrior to empower our people with a lifetime of learning, with technology that is integrated with the human being, and with more choices and incentives in a competitive career environment." NPS is partnered with many defense and civilian universities. These partnerships, which allow NPS to deliver defense-related education when and where it is needed, include the Air Force Institute of Technology (AFIT), Stanford University (for Homeland Security), the University of Maryland and Smith School of Business (for defense-related MBAs). NPS is currently running 11 non-resident degree programs, 85 on-line courses, 4 Navy-relevant distance learning certificate programs, more than 300 courses using web technology, 5 online distance learning courses on board ship, 215 locations for distance learning (via video teleconferencing, internet, satellite campuses, etc).

"We will continually adapt how we approach and confront challenges, conduct business, and work with others." National Defense Strategy, March 2005

NPS: A TOOL FOR TRANSFORMATION

The Office of Force Transformation now sponsors

an NPS Chair and course development in one of the first programs in Transformation Education and Research, through the NPS Cebrowski Institute of Information Innovation and Superiority. The new "National Defense Strategy's" section on Defense Transformation states that,

"Transformation is not only about technology. It is also about:

- Changing the way we think about challenges and opportunities
- Adapting the defense establishment to that new perspective, and
- Refocusing capabilities to meet future challenges, not those we are already most prepared to meet."

It goes on to say that, "We are working to transform our international partnerships, including the capabilities that we and our partners can use collectively."

NPS is vital to DoD's interactions with other agencies and nations for national security. As has been shown, NPS programs strengthen democratic civil-military relationships in countries throughout the world. The "National Defense Strategy" plainly proclaims a goal fully supported by the Naval Postgraduate School, "We seek to foster a culture of innovation."

NPS: Navy Education Strategy's Center of Gravity

As a matter of national security, the Navy needs to do a better job of managing the careers of our young warfighters. We must develop an education strategy that builds postgraduate education into the career paths of our officer and enlisted leadership as both a reward and an incentive. There is no better military environment in which to earn a postgraduate degree than the Naval Postgraduate School with students representing all services, several US Government agencies, and more than 60 countries. This is the future operational environment: technology serving joint, interagency and combined operations worldwide. Further, we need to think of all our Navy family, uniformed and civilian, and their dependents. Through distributed distance learning we can provide the means to develop draw the best and keep the best happy.

Naval Postgraduate School represents the beating heart of the Navy's future Human Capital Strategy. We truly must "Win in the marketplace for talent." We can only do this by investing in and demonstrating a commitment to the education and training of our people. From their recruitment, to their retirements, and beyond into our nation's workforce, we must provide the opportunities for our leaders to excel: personally and professionally. Sadly, fewer American's are seeking technical degrees in college. Many officers with non-technical degrees are asked not only to be leaders, but to work in a highly technical environment with sophisticated weapons systems. Our enlisted sailors who demonstrate a technical aptitude are likewise trained to perform highly complex tasks in a stressful environment. In fact, more and more of our enlisted sailors (and soldiers, airman, marines) are entering the service with degrees or pursuing degrees via distance learning. Having demonstrated the maturity and capability of performing the most exacting jobs in the most stressful conditions, our warriors have earned the right to learn more, to progress educationally. They deserve the opportunity to fulfill their career goals both in the service and after they leave the service.

In the next year, the Defense Department needs to hire more than 14,000 civilian scientists and engineers. But the pool of candidates is shrinking. More than half of science and engineering graduates from American universities are foreign nationals, who are mostly off limits to federal agencies. Moreover, DoD must compete with the private sector and other agencies for the talent that is available. Naval Postgraduate School is ninth in the nation in the production of science and technology Master degrees. In fact, NPS is graduating 18-20 civilians a year to serve in all agencies of the government. By developing an education strategy built upon continuing education, career management and counseling, we can ensure our nation has technically qualified and innovative sailors, soldiers, airmen and marines who are capable and willing to carry their experience and education into the civilian work force when they retire.

Naval Postgraduate School is ideally placed to serve as the centerpiece of a Navy Education Strategy that takes a total force, lifelong approach to serving our Navy family and our nation's defense needs.

[CDR Porter, 20 Mar 05]

TITLE

Address by Admiral Arleigh Burke, USN, Chief of Naval Operations Before the [Naval] Postgraduate School

REF NO. 620-59 News Release: Department of Defense, Office of Public Affairs, Washington 25, D.C. • May 28, 1959

ABSTRACT

On the 50th anniversary of the Naval Postgraduate School and the 5/28/59 graduation exercises, Admiral Burke commended the officer students for their hard work in obtaining their graduate degrees. As leaders he urged them to continue gaining knowledge in military as well as political and international affairs, to keep their perspective, and to retain their "moral and intellectual integrity." This being 1959 during the cold war, he urged the study of Communism to understand how it works and not be misled by propaganda.

EXCERPTS

"The Navy has been a leader in this rapid technological advance. But this did not come by accident, nor did it come overnight. It has been the result of educating carefully selected officers in each succeeding generation of officers … All with but one purpose, one objective, to improve the Navy's combat-effectiveness, and the security of the United States."

"Naval postgraduate education is an added asset of the line officer of the Navy. It helps him to do a better job afloat. It allows him to be in the forefront of development when ashore. Each naval officer who has acquired technical knowledge realizes that this knowledge increases his value to his profession, that he knows it as a stepping stone to greater and broader responsibility. He can expect and should solicit billets in his career that will involve command, planning and national strategy and work. He should solicit the war college training so helpful to these duties."

"We in the Navy today are the inheritors of that legacy of wisdom, and we can see clear evidence of their foresight all around us. Operating at sea now and ready for combat is a family of guided missiles. The application of nuclear power in our submarines and in our surface ships is well known. The Navy has been in the forefront of development in radar, radio, the gyro compass, and many other complex devices which our predecessors applied in naval weapons systems."

"Leadership is needed more today than ever before. You are the ones who will push the revolution onward, who will produce the new machines, and who will lead the men. It is you to whom they will turn for guidance, precept, example, inspiration. Your personal philosophy, your inner values, your sense of moral responsibility, and your willingness to work hard will be vital to the efforts of the men."

CD REF NO. PW–6

Address By Admiral Arleigh Burke, USN Chief Of Naval Operations Naval Postgraduate School, Thursday, May 28, 1959

It is a pleasure to be in Monterey to participate in the graduation exercises of this fine institution.

It is not only a pleasure but a welcome opportunity for me, an opportunity because you are a very important group, important to your service, important for the future of your country.

You are important because you now combine service experience with advanced knowledge. You are important because you are good, or you wouldn't have been selected to come here in the first place. You have capability for work, and we intend to use it.

This year we mark the 50th anniversary of the founding of this splendid school. In 1909 ten students in Marine Engineering constituted the first class in the Navy's postgraduate school program, a program which has grown and expanded over the years.

The naval leaders of fifty years ago showed great perspective and foresight in seeing the need for advanced technical and scientific knowledge among naval officers. They recognized that ships and naval weapons were becoming more complex, that their proper employment at sea would require officers who were familiar not only with the age-old profession of the sea, but who could also understand and could use effectively the complex weapons of the years to come.

We in the Navy today are the inheritors of that legacy of wisdom, and we can see clear evidence of their foresight all around us. Operating at sea now and ready for combat is a family of guided missiles. The application of nuclear power in our submarines and in our surface ships is well known. The Navy has been in the forefront of development in radar, radio, the gyro compass, and many other complex devices which our predecessors applied in naval weapons systems.

The Navy has been a leader in this rapid technological advance. But this did not come by accident, nor did it come overnight. It has been the result of educating carefully selected officers in each succeeding generation of officers. It has been essential to train officers who could assimilate the education they would receive, who would continue their professional interest, who would be fully qualified for command at sea, and who would combine the scholar's interest in science and technology with the practical man's appreciation of how new discoveries can be applied. All with but one purpose, one objective, to improve the Navy's combat-effectiveness, and the security of the United States.

Naval postgraduate education is an added asset of the line officer of the Navy. It helps him to do a better job afloat. It allows him to be in the forefront of development when ashore. Each naval officer who has acquired technical knowledge realizes that this knowledge increases his value to his profession, that he knows it as a stepping stone to greater and broader responsibility. He can expect and should solicit billets in his career that will involve command, planning and national strategy and work. He should solicit the war college training so helpful to these duties.

The start of this school opened a host of opportunities for the advancement of naval and military science previously not available. These opportunities are not restricted to the United States Navy alone. Here today are officers of all United States military forces and from nations who are among our country's closest friends.

It is well that you have studied and learned together. There may be times when we of the services represented here will fight along side of each other in support of the strong beliefs we share. At such times, our common purpose will be supported by the

knowledge you hold in common.

My remarks today are directed toward the naval side particularly but I hope you of our sister services with bear with me and interpret these remarks as appropriate to you.

Compared to the first class of ten officers there are some five hundred of you who now complete your studies. It is a wonderful thing that so many of you could be given this coveted opportunity. An opportunity which I am sure was well used or you wouldn't be here on this day.

Today should be a day of pride for you, filled with feelings of accomplishment. You have attained another goal along the route of life. You have succeeded in something worthwhile. So doing, you have strengthened one of the best habits of life, the habit of finishing a hard task you started.

Finishing difficult tasks can become a habit, and like all habits it gains in strength and adds to what you are able to accomplish. It is a habit that thrives on enthusiasm and a consuming interest in what you are doing.

You had to work hard here at this school, very hard. This is something which you will come to value, for not only have you gained an advanced professional knowledge, but also you have gained a confidence in yourself that you can face and thrive on hard work. The ability to stand up under pressures whether they are mental or physical is as great an asset as is your increased professional knowledge, perhaps even greater. This is something you will realize more and more as you assume larger and larger responsibilities.

As you go on in your careers, you will find that both your knowledge and your ability to stand up to the difficult, will be well used. For the more you do, the more you can do. The more you accomplish, the more the world, your seniors, messmates and juniors, will look to you to do. This is, and will be your responsibility. This has long been the responsibility of those with knowledge and stamina. Fortunately for the Navy, the responsibility to act and to accomplish, has been wel1 carried in the past.

Doing and accomplishing provide one of life's greatest satisfactions, self-satisfaction, a knowledge that you have done your best, that you have pulled your weight in the boat. This often brings success. But whether it is recognized or not, there remains your inner satisfaction, your feeling of worth to yourself and your fellow man.

It is pleasant to have the plaudits of the crowd. It is pleasant to receive a "Well done" from the Task Force Commander. But there is even more satisfaction, when others may not have noticed, if you can say to yourself, "I have done my part, and a little extra." To achieve this satisfaction, to gain success, the important thing is to do everything to the best of your ability, regardless of how large or small you think the job is. There is no job in the Navy that is beneath you. Your every assignment is worth your very best.

Each time you do something well, you help your service, you increase your own satisfaction, you enhance your reputation, you strengthen your hold on the habit of hard work, and success is more apt to come your way.

As you continue to seek success for this wonderful Navy of ours, and your own sake, there are major thoughts to be always before you.

First you must continue to enlarge your knowledge, not only in formal schools, but in your own reading. You must continually broaden and exercise what knowledge you have.

Today, man's horizons of knowledge are widening at an ever accelerating rate. Within my lifetime the field of what was once a specialty has developed, divided, subdivided and redivided.

Your quest for knowledge must be broad, it must be spurred by intellectual curiosity, a curiosity which is its own motivating force, and provides its own momentum.

To meet the responsibilities that will fall your way as you advance in seniority, you must know an awful lot. It is not sufficient to merely to continue learning in the particular field of interest to you. You must know that certainly, but more too, what is going on in allied fields, what is going on in the service, what new ideas are being generated, what is going on in the world, what can the United States do about it, what can the service do about it, what can you do about it.

All these bits of knowledge you will need, if you are to be prepared for responsibility, for opportunity. Opportunity often comes when you least expect it. You can take advantage of it, only if you are prepared. Knowledge is the basic element of being prepared.

In expanding your intellectual horizon, I would commend to you readings on the meaning of communism and its nature. This is singled out, because this is the greatest threat to the Free World today.

We are in cold war and sometimes in limited wars. In both of these, all of us are participants. Unless you know how the communist thinks, what he thinks and what he really means, you will be duped. Every day the Soviets fight us with ideas, psychology, propaganda. A lot of the propaganda is very competent, so competent in fact, some of it is believed and spread by strongly patriotic Americans. They have been misled because they do not know enough about communism.

If they, and you, understand what the communists are working for, how they go about it, and how they express it, then you, and they, will know fact from communist fiction. You will not be misled.

This is important, because you are leaders of men. You have been chosen for an opportunity not accorded to all men. Your word carries a lot of influence. If you know what is true and real, then you can lead properly.

Even though I have singled it out, communism is but one of the things about which you should learn, if you are to have the knowledge that will be expected of you. You may never be able to learn all that you will need to know, when you move on to positions of greater responsibility. But unless you keep working at it continually, you will never know a fraction of what you should.

The second point to remember is to keep your perspective. Specialize if you will. Understand and be rightfully proud of your particular field of interest. Know the importance of what you are doing. But remember, always remember, where your interest fits into the whole. What you do must advance your specialty, but also it must advance your service, your country.

There are well-sought-after jobs in the Navy, and then there are those nobody wants. Both should fall your way. Take both in stride.

Many naval officers want to lead destroyers in to bombard the enemy shore. Many naval officers want to move wave on wave of troop-laden boats to the beach. Before either of these things could happen, the hard working minesweepers had cleared the way.

Many officers want to be building the latest missile, to be building a rocket to challenge outer space. But none of these could happen unless other officers, had not spent a lot of effort and a lot of time, convincing the people who husband the taxpayer's money, convincing the Administration, convincing the Congress, of the worth of the program.

All these tasks are important when seen with perspective, for they are all things that make your service move ahead. If you ever allow yourself to lose perspective, you are apt to let your service down. You are apt to consider your field the only important one, to forget that it is but a part of the whole. Perspective will help you remember that you are a professional officer first, and a specialist secondarily.

In the Navy, the very uniform you wear should remind you of this. You wear the proud blue and gold of the naval profession. On this uniform, the corps insignia, the dolphins, or the wings are but a small part. Some specialties do not even show on your uniform. They are merely numbers behind your name. All this is as it should be. For you are a professional naval officer first and last.

The third point I would suggest, is to retain your moral and intellectual integrity. These essential, these vital elements of a successful naval officer are always emphasized throughout the Navy, because of their undying importance. You have heard, and you will hear, much said about moral integrity.

However not so much is said about intellectual integrity. Since you are men of intellect, and will soon be called upon to use this wonderful faculty under many and trying circumstances, it is appropriate to consider intellectual integrity.

By intellectual integrity I mean honesty of mind, truthfulness with yourself. It includes mentally calling things as you see them. It means calling red, red and not cerise because that is the fashion of the moment, it means calling black, black, and not dark gray because someone wants you to. It means if something is bad, admit it is bad and don't call it good because you wish it to be so. It means forming your own opinion.

Sometimes in forming your own opinion you must necessarily be critical of things as they are, or of a plan that has been proposed. Criticism is fine, but be careful of it. It is very easy, particularly when you have no responsibility, to be critical of somebody else's work. Criticism by itself doesn't help anybody. Criticism can be helpful only if the suggested solution is also put forward.

Even that is frequently not enough. There will be occasions when there are many different views on a subject. For an organization to go forward, decisions must be made, and those decisions must be supported, or else the organization falls apart. This means that you must give weight to other people's views. If your views are not always accepted, you should support the decision made.

Nations have grown weak and ineffective because of divisiveness within the nation. As a matter of fact, this is the usual reason why nations disappear, the many factions which exist within a nation. There is truth in the old axiom that "in unity there is strength, in common accord there is power." So it is a fine line that you have to follow between being critical and being obstructive with your criticism. It takes judgment, judgment which you are generating as you go through life.

There will be many times when those who lack integrity, seem to fare better than those who have it. There will be times when such apparent success will tempt you to chuck integrity aside, and get on the gravy train. Don't do it, for when you do, you chip away at your greatest moral asset, character, you lessen your self-respect, and ultimately but certainly, the respect others have for you. These are the things that make you a man, an officer, and an effective leader, precious things to be guarded jealously for your country, your service, your men, and yourself.

Since World War II, there have been many spirited discussions on issues of national interest, such issues as national strategy, defense organization, weapon systems concepts. Each service has had very strongly held viewpoints. On these issues the Navy has had to stand up for what it believes. Each time we have had to stand up for our viewpoint, we rested our case on honesty, on integrity. This is as important as the issues themselves. For national security, present readiness, future capabilities, and even economic conditions depended on their outcome.

Because of this, on Capitol Hill today the Navy has a reputation for honesty and integrity. This stands us in good stead. When the very importance of the issues, the strength of the differing viewpoints, confuse even the most conscientious, our reputation provides the much needed support.

A Service reputation is made by many people, so many people in the Navy must have demonstrated integrity for the reputation to have been made. As long as we continue to keep integrity a hallmark of the United States Navy, we shall always have the respect, and support of staunch friends. If you hold your personal integrity high, you will have respect and support when you need it.

Enlarge your knowledge, keep your perspective, retain your integrity, and we will weather the storm of today's revolution. History teaches us of the Industrial Revolution and its effects on world civilization, effects still felt in many parts of the world. Today, the world is in an even more tremendous and faster moving revolution. It is a revolution of science and technology, and its effects are being felt in every nook and cranny of the world.

Science and technology are no longer simply advancing. They are exploding. Think of the changes during your own lifetime, in our knowledge and use of the atom, the electron, automation, outer space, medicine and health. These things affect us all, both in the deepest and simplest ways.

The atom and its nuclear energy already has altered the lives of peoples and their dealings with one another. By some it is viewed as a sword of Damocles, and by others as a potential savior.

The electron allows us to exchange ideas with the remote peoples of the earth. It also distracted you from your studies when that good television show came on.

Automation gives the engineers among you a calculating tool never available to your fathers. It gives industry a means of quality mass production that can have effects both good and evil.

Outer space comes daily closer and closer to us. Once only in the realm of wild-dreaming authors, it now belongs to the scientist. Tomorrow it will belong to mankind. Today we are probing the depth of the sea and the outer reaches of space.

Medicine advances by leaps and bounds to overcome the most fatal diseases of yesteryear, and lays before us the problem of greatly expanding populations.

No matter where we look, we face new boons, and new problems. This Revolution has reached the very keel of our Navy. It is up to us to master it.

The Industrial Revolution brought steam to the Navy and left sail in its wake. It replaced smooth bore with rifles. It replaced paddle-wheels with propellers. It changed Naval strategy, tactics and logistics. But it took two generations to do all this.

Today we are moving rapidly ahead in nuclear power and missiles. We have evolved the ALBACORE hull, more effective propellers, weapons of devastating destruction, missiles of phenomenal accuracy, and all at a pace that bewilders the soul. This pace causes us to ponder, but does not allow us the time.

Throughout the industrial revolution there were, and throughout this scientific and technological revolution there will be many changes, yet one element of the Navy remains unchanged. It is man, his character and his values, that stands as the most essential ele-

ment. It is man who controls the machines, man who maintains the machines, and man who must stand up against the new problems created by the machines. Men are, and will remain, the soul of the Navy.

Leadership is needed more today than ever before. You are the ones who will push the revolution onward, who will produce the new machines, and who will lead the men. It is you to whom they will turn for guidance, precept, example, inspiration. Your personal philosophy, your inner values, your sense of moral responsibility, and your willingness to work hard will be vital to the efforts of the men. Your opportunities are unlimited. As officers your responsibilities are great. Your country, your Navy and your shipmates, look to you. With knowledge, with perspective, and with integrity, you will succeed. The opportunity is yours: it's up to you.

TITLE

NPS: The Case for Value

SOURCE

NPS Internal Document, Author Unknown, 2004

ABSTRACT

Calling the Naval Postgraduate School "a uniquely valuable national asset," the article focuses on how effectively NPS' curricula surpass any program offered by civilian universities and costs less than a peer university; how the NPS program responds quickly to changing military and national security needs; and how it offers U.S. officers opportunities to interact with international officers. Also featured are Distinguished NPS alumni who "show the value of their NPS education in future assignments."

EXCERPTS

"At NPS, unlike a civilian graduate school, military applications pervade school life both inside and outside of classes, while every student must do defense-related research. Educational effectiveness and efficiency measured by graduation rate, cost to obtain an equivalent degree, student-faculty contact hours, faculty-student ratio, and time to graduation are uniformly superior at NPS."

"Cost per credit hour is a vehicle for getting at the true difference … Dividing this total instructional cost ($56,019,869) by the 1,336 students on board in FY 2002 and by 64 credit hours per year (15 per quarter) results in the estimate of $655 per credit hour at NPS. This number compares with an average of $724 at NPS' peer institutions."

"NPS teaching and research reflects the needs of both the fleet and the Navy's shore establishment, as well as other DoD and national security priorities. As seen in the Afghanistan and Iraq conflicts, NPS responds quickly to emergent DoD war-fighting requirements and applies science and technology to address near term and high profile issues."

"NPS counts among its graduates at least 34 astronauts, a number of service secretaries, and hundreds of officers of flag rank … The unique combination of military and civilian ingredients in NPS graduate education increases the value of a military officer in both combat and non-combat roles. NPS graduates show the value of their education in subsequent military assignments and in later civilian careers, as well."

"NPS is one of the vitally important contact points between the military and civilian worlds, particularly in the realm of education and research. At these points, the two worlds help sustain and strengthen each other. Amidst the international culture and technical vibrancy of the Monterey area, NPS interacts in a richly synergistic intellectual environment. The Naval Postgraduate School is a uniquely valuable national asset."

CD REF NO. PW–7

NPS: The Case for Value

INTRODUCTION

Officers in the United States armed services have unique educational needs. Although civilian and military subject-matter fundamentals are generally the same, applications of these fundamentals differ widely. Just as graduate studies in a civilian university prepare students for work in the civilian world, so military graduate students require coursework suffused with military applications.

The United States Navy particularly requires graduate education in a military university because of the technical complexity of sea and shore naval operations around the world. At sea, technical requirements are becoming increasingly demanding. Other U.S. armed services also require officers with advanced education to manage the complexities of 21st century warfare. Relevant graduate education directly contributes to combat-effectiveness. While ashore, working in their subspecialty areas, naval officers do staff work in a military setting. In this work, in addition to military education and experience, they require the same level of professional expertise as their civilian counterparts. Some of this work will be technical, requiring engineering and science education, while other will be managerial, benefiting from a military MBA program. Some will require cultural, linguistic, or policy expertise, particularly in relation to other nations. Military graduate education can increase the effectiveness of officers of all armed services who fill both combatant and non-combatant roles.

The Naval Postgraduate School is a military university that uniquely meets the graduate education needs of both U.S. and allied military officers. World War ll hero Admiral Arleigh Burke, NPS 1930 graduate, characterized the school aptly and succinctly in these words: "This splendid school opened a host of opportunities for the advancement of naval and military science not previously available." The only other graduate institution that can compare with NPS as a military university is its smaller and more narrowly focused sister school, the Air Force Institute of Technology (AFIT), with which NPS has an ongoing active relationship. From the establishment of NPS in 1909, the military value of NPS graduate education has continued to increase until today it greatly exceeds anything offered in the civilian world.

At NPS, unlike a civilian graduate school, military applications pervade school life both inside and outside of classes, while every student must do defense-related research. Educational effectiveness and efficiency measured by graduation rate, cost to obtain an equivalent degree, student-faculty contact hours, faculty-student ratio, and time to graduation are uniformly superior at NPS. All these are facts solidly established by the following documentation.

NPS IS THE GRADUATE SCHOOL OF CHOICE FOR MILITARY OFFICERS

Comparisons of curricula and course offerings between NPS and civilian universities with similar degree programs make clear the superior relevance of NPS for the graduate education of military officers. Few if any civilian universities have defense-focused curricula such as *Homeland Security, Special Operations, Systems Engineering and Space Systems, Undersea Warfare, Naval Systems Engineering, Combat Systems Sciences and Technology, Information Warfare,* or studies relating to the *Middle East, Africa, South Asia.* Yet these are some of the many military-oriented curricula offered at NPS. A like case can be made for special course offerings such as *Aircraft Combat Survivability, The Economics of U.S. Defense Policy, Joint Intelligence and Military Command, Joint Campaign Analysis, Radar Systems, History of Special Operations, Software Development for Combat Systems, Underwater Acoustics, Logistics Engineering, and Financial Management in the Armed Forces.* Even in NPS courses having non-military names like Statistics, military applications predominate, such as the use of multiple regression

in manpower-requirements determination. Notably different from civilian universities, while offering traditional academic degrees, NPS encourages and even demands a military framework for its coursework and related student research.[1]

Outside the curricula leading to master's degrees, programs in counterterrorism, homeland security, post-conflict security building, civil-military relations, and counter-drug strategy and policy place NPS in the forefront of educational institutions that support national security priorities.[2]

When students work together on research projects at NPS, not only do the project teams usually consist only of military officers but also these officers may often be members of different military services and even from different nations. Opportunities to work or study with military colleagues across service and national boundaries exist in virtually every unclassified course at NPS. These experiences are rare, if non-existent, at civilian universities.

NPS IS SWIFT TO RESPOND TO CHANGING FLEET AND NATIONAL SECURITY NEEDS

NPS teaching and research reflects the needs of both the fleet and the Navy's shore establishment, as well as other DoD and national security priorities. As seen in the Afghanistan and Iraq conflicts, NPS responds quickly to emergent DOD war-fighting requirements and applies science and technology to address near term and high profile issues.

The mechanisms for this process, unique to NPS, are the *Educational Skill Requirements* (ESRs) for the school's curricula and the *reimbursable research program.*

Each curriculum at NPS has a Navy, DoD, or other national security sponsor, usually a Washington-based flag or general officer, as well as its own set of ESRs. The ESRs for a curriculum determine the objectives of the required courses. Biennially, NPS faculty members work with curriculum sponsors to ensure that the ESRs reflect current Navy, DoD, and national security needs. In addition to the Navy, sponsors of NPS curricula include members of the Army, the Air Force, the Marine Corps, the National Security Agency, the Department of Homeland Security, Special Operations, and the Army National Guard.

Since the sources of reimbursable research funds are commanders of Navy sea and shore facilities, as well as other DoD and national security activities, the NPS research program ensures that its work is responsive — often vitally responsive — to Navy or, more generally, national security research needs. Faculty involvement in research on national security issues also helps keep classroom instruction abreast of latest developments contributing to the enhancement of national security.

NPS RESEARCH IS UNIQUELY USEFUL TO NAVY AND DOD ACTIVITIES

NPS research centers and institutes target research work on specific Navy, DoD, and other national security needs. Examples of projects worked on include electric ships, directed-energy weapons, and rail guns. As Exhibit 1 shows, fully 85%, of NPS reimbursable research by faculty is directed at military concerns. No civilian university is likely to come close to this percentage. NPS students are mature military officers who make their contribution through the completion of a research thesis as a requirement for graduation. There are also 200 or so MBA students who must complete group research projects each year. Most student theses and projects, directed by faculty, address problems relating to military issues.

In the short term, NPS research, being directed at military problems, is uniquely useful to Navy and DoD activities. Like all research products, however, the products of this research often find applications in the civilian world. Former NPS faculty member Gary Kildall created the "parent" of DOS (disk operating system), which, prior to Windows, made the word- and data-processing capabilities of computers available to practically anyone who had access to a personal computer. Today, computer programs that help "smart weapons" see targets also help physicians pinpoint breast tumors for radiation therapy, and self-lubricating ball bearings developed for the space shuttle also help reduce the temperature of high-speed dentist drills. NPS cutting-edge research in areas such as electric ships and directed-energy weapons will be important not only to the Navy's future warfare capabilities but also, when applied commercially, to the enrichment of civilian life. These are just a few of many examples of military-

[1] Secret or higher clearances are required for some courses, and the prerequisite for one course, Joint Campaign Analysis, is four or more years of experience in the field or the fleet.

[2] NPS faculty and students work closely with the Unified Combatant Commanders in education and research critical to the accomplishment of their missions.

to-civilian technology transfers. The Navy's China Lake facility has a Web site dedicated to technology transfer; NASA has a newsletter called *Goddard Tech Transfer News*. NPS also plays a key role in transforming military technology to benefit the U.S. economy. Technology transfer is an important military activity, and it occurs at NPS.

NPS COMPARES FAVORABLY WITH OTHER UNIVERSITIES ON MEASURES OF QUALITY

The National Center for Educational Statistics (NCES) through its IPEDS (Integrated Postsecondary Education Data System) Website provides numerical data useful for comparing NPS with other universities. Exhibit 2 shows a number of these comparisons. Particularly notable: although NPS has the lowest ratio of administrative staff in all categories to faculty, it has the highest faculty-student ratio within a peer group of 12 U.S. universities that share its technical and research orientation (see ranks in the bottom row).

The high faculty-student ratio at NPS reflects the absence of teaching assistants in an almost solely military student body. As a measure of effectiveness, a high faculty-student ratio is an educational plus, but does this plus come at the expense of a costly minus in the efficient use of financial resources? Not at NPS. As shown in Exhibit 4, NPS ranks 7th lowest — and below average — among 12 institutional peers in cost per credit hour.

Graduation rate merits especial attention. Different from its peer universities, NPS does not require its applicants to take an entrance test like the Graduate Record Examination (GRE). Institutions such as Cal Tech and MIT, cited in Exhibit 2, have among the highest entrance-examination mean scores of all universities in the nation. A substantial purpose of requiring entering students to have high entrance-examination scores is to assure high student retention and graduation rates, especially in demanding curricula. Though important, academic aptitude measured by entrance tests is not the only personal attribute contributing to student success. Traits in the realm of motivation and character also contribute to this success, and NPS students, who throughout their careers are routinely evaluated in fitness reports, tend to have such traits in abundance. NPS knows its applicants well. This, reinforced by the military success ethos pervasive at the school, is likely the reason that NPS has a 97°/o graduation rate despite the absence of an entrance test.

Still, a reasonable question is how NPS students might compare with other graduate students on the GRE. NPS has addressed this question by administering the GRE on a number of occasions in the past, the finding being that NPS students in the samples tested scored above average on the GRE. That result is not surprising. While not directly testing academic *aptitude*, each curriculum at NPS requires it applicants to have an educational *achievement* profile measured by three digits of an Academic Profile Code (APC) reflecting undergraduate grades overall, as well as courses and grades in mathematics and science.

Student-faculty contact hours constitute an important measure on which to compare NPS with its peer universities. At four quarters per year, 12 weeks per quarter, and 16 classroom hours per week, NPS averages an annual total of 768 student-faculty contact hours, or 1,152 student-faculty contact hours in a typical six-quarter NPS master's degree program. These numbers vary at civilian universities. According to an NPS technical report,[3] U.S. graduate students attending non-military schools typically attend classes 13 hours per week for 32 weeks in a standard academic year plus, sometimes, 7 hours per week in a 10-week summer term. That is an annual maximum of 486 student-faculty contact hours at a typical civilian university. The NPS contact-hour experience is clearly superior: about 58% greater at NPS than at a typical civilian university (100 X (768-486)/486).

Since NPS has no graduate assistants, as noted earlier, all courses at NPS are taught by faculty. If for this reason alone, NPS students are uniquely fortunate. Measured by degree source and research activity, the NPS faculty is comparable in academic strength with any other technical university in the world.

A DEGREE COSTS MUCH LESS AT NPS THAN AT A PEER UNIVERSITY

What are the comparable costs of a degree at NPS and its peer universities? To complete a master's degree program having contact hours equal to those at NPS, a student would have to attend a civilian university for about 28 months (12 X 1,152/486 = 28.4), as opposed to only 18 months at NPS. This difference has tremendous cost implications favor-

[3] Gates, W. R., Maruyama, X. K, Powers, J.P., Rosenthal, R. E., & Cooper, A. W. M. (1998). *A bottom-up assessment of Nayy flagship schools: the NPS faculty critique of CNA's report* (Report No. NPS-FC-98-00). Monterey, CA: Naval Postgraduate School.

ing NPS. Assuming equal student-faculty contact hours and equal faculty pay, it implies that the cost for a student to earn a graduate degree is on average almost 58% more at a civilian graduate school than at NPS (100 X (28.4-18)/18).

Even a cost differential as high as 58o/o underestimates the true difference because it fails to take into account student pay over the ten extra months (opportunity cost).

Cost per credit hour is a vehicle for getting at the true difference. Although NPS does not charge tuition for Navy and Marine Corps students, the NPS operating budget shown in Exhibit 3 for FY2002, together with the 1,336 students on board that year, provides data for estimating NPS cost per credit hour comparable with credit-hour costs at peer institutions. This estimate depends on the total instructional cost, which from Exhibit 3 may be calculated as the direct academic cost ($48.8 million) plus the fraction of direct base-operations cost attributable to non-reimbursed academic functions ($27.4 million times 48.8/185.2, the 185.2 being total expenditures minus student salary): $56,019,869. Dividing this total instructional cost by the 1,336 students on board in FY2002 and by 64 credit hours per year (16 per quarter) results in the estimate of $655 per credit hour at NPS. This number compares with an average of $724 at NPS' peer institutions, as shown in the first column of Exhibit 4.

What would a master's degree cost if the Defense Department sent students to a civilian university rather than to NPS? The entire cost differential between NPS and other universities must take into account 10 months of a student's salary because a student would have to attend a civilian university 10 months longer than NPS to obtain an equivalent degree. The second and third columns of Exhibit 4 show the results of accounting for student pay, determined from Exhibits 3 and 5 by dividing student salary ($129.3 million) by the number of military students (943) in 2002 and multiplying the result by 10/12: $114,263.

Unlike civilian universities, NPS curricula include courses that U.S. military students must take for credit toward their Joint Professional Military Education (JPME) requirements. The expense of providing these courses would add to the cost of sending U.S. military officers to a civilian university instead of NPS.

NPS GRADUATES SHOW THE VALUE OF THEIR EDUCATION IN FUTURE ASSIGNMENTS

NPS counts among its graduates at least 34 astronauts, a number of service secretaries, and hundreds of officers of flag rank. Among NPS' distinguished military alumni: Admiral Arleigh Burke (World War II hero and former Chief of Naval Operations), Captain Eugene Cernan (astronaut who last walked on the moon), Admiral Moshe Marom (Vice Chief of Naval Operations, Israeli Navy), Admiral Henry Mauz (former Commander in Chief of the Atlantic Fleet), Admiral Hyman Rickover ("father" of the nuclear Navy), Admiral James Watkins (former CNO and Secretary of Energy), Admiral James D. Watkins (former CNO), Admiral Michael Mullen (former Vice Chief of Naval Operations), Vice Admiral Arthur Cebrowski (current Director of the Office of Force Transformation for the Secretary of Defense), Rear Admiral Wayne E. Meyer (former Deputy Commander for Weapons and Combat Systems, Naval Sea Systems Command, and "father" of the Aegis weapons system), Captain William "Deak" Parsons (former Associate Director of Los Alamos Laboratory), Captain James Roche (current Secretary of the Air Force), and Brigadier General Thomas White (former Secretary of the Army). Among notable DRMI short-course graduates: HRM Abdullah (King of Jordan), HRM Aisha (Princess of Jordan), Ricardo Lopez Murphy (Minister of Defense, Argentina), Girts Valdis Kristovskis (Minister of Defense, Latvia), Vasile Dudu (Minister of Defense, Romania), and Renato de Villa (Minister of Defense, Philippines). Some NPS graduates have also attained notable achievement in the civilian world, one outstanding example being Gordon Eubanks (former CEO of Symantec and current CEO of OBLIX), another Kevin Sharer (CEO of Amgen). The unique combination of military and civilian ingredients in NPS graduate education increases the value of a military officer in both combat and noncombat roles. NPS graduates show the value of their education in subsequent military assignments and in later civilian careers, as well.

NPS PROVIDES DAILY INTERACTIONS AMONG MILITARY OFFICERS OF OTHER NATIONS AND U.S. OFFICES OF DIFFERENT SERVICES

NPS provides valuable opportunities for U.S. and international military officers to interact in educational activities focused on military problems. International officers sit side-by-side in classes at NPS with U.S. officers. During the academic year 2003–2004, NPS had 356 international degree seeking students out of a student body of 1,491. These international students represented 60 different countries. The School of International Graduate Studies (SIGS), one of NPS' four graduate schools, and the

NPS Center for Executive Education provide especially rich opportunities for such interaction. The Defense Resources Management Institute (DRMI) at NPS has long delivered high-quality short courses tailored to the needs of international officers. The local community provides civilian support for DRMI by "adopting" its students — warmly welcoming and familiarizing them with American society and culture. Monterey — with NPS, the DLI-FLC (Defense Language Institute — Foreign Language Center), and MIIS (Monterey Institute of International Studies) at its center — is a highly sought after destination for international students.

In all four of NPS' graduate schools, officers of different military services study together. Exhibit 5 shows this distribution, together with international officers and civilians, in average-on-board (AOB) numbers for 2003. Though administered by the Department of the Navy, NPS is a graduate-education home to members of all U.S. armed services.

NPS EXISTS GEOGRAPHICALLY IN A SYMBIOTICALLY RICH MILITARY AND TECHNOLOGICAL ENVIRONMENT

The Monterey Bay area is home to a number of military institutions in addition to NPS. Notable among these are the Defense Language Institute — Foreign Language Center (DLI-FLC), the Naval Research Laboratory (NRL), the Defense Manpower Data Center (DMDC), the Army's Monterey TRADOC (Training and Indoctrination) Element, and the Fleet Numerical Meteorology and Oceanography Center (FNMOC). This is the Monterey Model: sharing and leveraging resources. All these institutions collaborate on military educational and research programs, as well as efforts to effect civilian regional improvement. In libraries, laboratories, and other venues, faculty, students, and staff at NPS have opportunities to work with their counterparts at these other local institutions in constantly emerging cooperative endeavors.

The nearby Silicon Valley, with its many cutting-edge information technology companies such as Cisco Systems and Seagate (not to mention Apple Computer and Sun Microsystems), provides numerous opportunities for mutually beneficial links between NPS and industry.

NPS IS DEVELOPING EDUCATION AND RESEARCH METHODS FOR THE 21ST CENTURY

NPS is well on its way into the 21st century in both its teaching and its research programs.

Life -long learning and distance (or distributed) learning (DL) are occupying an increasingly large portion of the educational activities of universities throughout the United States, and NPS is in the forefront of this movement. In a military extremely busy with operational activities, not all potential students have time for residence at a university. Many need to pursue their studies while deployed elsewhere around the world. NPS meets this current challenge. In addition to its roughly 1,600 full-time students, NPS currently has more than 600 DL students in degree and non-degree programs, and that number is increasing. For all its merits, it must be remembered that distance learning must be supported by a first class teaching institution such as NPS. It is noted that another 10,000 students enroll in NPS short courses each year.

In addition to planning a program of systematic curriculum-content reviews by faculty members of peer institutions, the school is currently engaged in and pursuing partnerships with many other universities, including Stanford University, the Massachusetts Institute of Technology, the Virginia Polytechnic Institute, Purdue University, the University of Maryland, the University of California at Santa Barbara, and the University of Southern California. These links help to keep NPS curricula abreast of current developments in academia. As NPS faculty focuses on military problems, its capability to address these problems must be constantly nourished by contact with civilian developments in teaching and research. NPS will maintain its currency in Information Technology (IT) with continued participation in national advanced networking, as well as consortia of universities and other research centers. These involvements will provide NPS faculty and students with tools required for leading-edge education and research. As the new century proceeds, NPS will seek to intensify its academic interactions by enhancing its sabbatical program, encouraging exchanges with faculties of other universities, and developing an increasingly active post-doctoral research program. NPS can be extremely attractive to post-doctoral fellows because of its unique access to Navy and DoD research funding. The return to NPS and DoD will be great since post-doctoral fellows from universities throughout the world can bring with them the latest developments in theory and methodology that might have important applications to military problems.

NPS IS A NATIONAL RESOURCE FOR SHAPING THE FUTURE NATIONAL SECURITY ENVIRONMENT

Like other research universities, NPS develops research methods and creates research products, but, unlike others, NPS concentrates its efforts almost solely on military problems or concerns. Particularly notable is that the NPS faculty focuses primarily on improving the military usefulness of its students rather than on replicating itself, e.g., as economists or physicists, or on preparing its students for work in civilian business administration or professions other than the military. The otherwise rare academician who eschews self-replication is commonplace at NPS, and his or her presence here constitutes a great measure of what makes NPS unique, as well as relevant, to Navy and DoD needs.

At the same time, NPS civilian and military faculty are comparable in quality to the faculty at high-productivity research universities on measures such as source of terminal degree and current research publication rate, as well as service as consultants to military organizations.

NPS accepts students in early-to-mid career and through refresher and transition courses, virtually unique in graduate-level academia, prepares non-technical undergraduate majors for graduate study in technical curricula. At NPS, undergraduate music or history majors have entered the space program as engineers. The time spent in the one or two quarters of refresher or transition work is made up in NPS' uniquely efficient programming of courses. At NPS, the courses that a student needs to take are always available when the student needs to take them.[4] A student at NPS wastes no time waiting for the availability of a required course.

NPS qualifies nationally as a Carnegie Research Intensive University, ranking 81st in 2001 among hundreds of comparable institutions in expenditures of federal research dollars, this reported in *The Top American Research Universities 2003* by John V. Lombardi, et al. NPS programs are also accredited by the Senior College Commission of the Western Association of Schools and Colleges (WASC), the Accreditation Board for Engineering and Technology (ABET),[5] the Association to Advance Collegiate Schools of Business (AACSB), and the National Association of Schools of Public Affairs and Administration (NASPAA). NPS not only compares well with its civilian counterparts; as a military university, NPS is unique in its class.

NPS is one of the vitally important contact points between the military and civilian worlds, particularly in the realm of education and research. At these points, the two worlds help sustain and strengthen each other. Amidst the international culture and technical vibrancy of the Monterey area, NPS interacts in a richly synergistic intellectual environment. The Naval Postgraduate School is a uniquely valuable national asset.

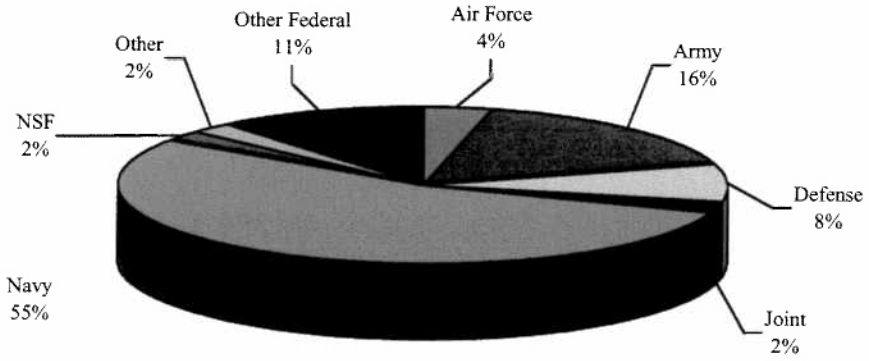
[4] Although sometimes a potential class size is too small to justify offering a course within a concentration option, this is not the case within streams of required courses.

[5] The NPS programs accredited by the Engineering Accreditation Commission of ABETS are Electrical Engineering, Mechanical Engineering, Aeronautics, and Astronautics.

Exhibit 1. Reimbursable Research Programs: 2002

Size of Program: $57,060.1K
Faculty Work Years: 165.72
Staff Work Years: 23.20

Sponsor Support



Source: NPS Research Office

NPS Office of Institutional Research

Exhibit 2. Comparison of NPS with Peer Institutions: Fall 2001

Institution	*Total FTE Faculty*	*Total FTE Students**	*Faculty per 100 FTE Students**	*Total Staff Personnel per 100 FTE Faculty*
Naval Postgraduate School	465	1,514	31	59
California Institute of Technology	554	2,058	27	213
Carnegie Mellon University	1,146	8,036	14	132
Georgia Institute of Technology	1,861	14,528	13	110
Illinois Institute of Technology	437	4,487	10	83
Massachusetts Institute of Technology	1,771	9,941	18	292
North Carolina State University at Raleigh	2,392	24,736	10	72
Purdue University (Main Campus)	3,494	36,826	9	72
Rensselaer Polytechnic Institute	746	7,220	10	106
Rice University	543	4,324	13	139
Rochester Institute of Technology	971	12,327	8	101
University of Southern California	3,371	27,361	12	97
Average excluding NPS	1,571	13,804	13	129
NPS Rank (out of 12, with 1 highest)	11	12	1	12

*For NPS, FTE Students is Average on Board (AOB)

Source: IPEDS

Exhibit 3. NPS Financial Summary: FY2002

Category	*Amount**	*Percent*
Student salary	129.3	41.1
Reimbursable academic	80.6	25.6
Direct academic	48.8	15.5
Direct base operations	27.4	8.7
Reimbursable base operations	17.7	5.6
Military staff salary	9.7	3.1
Non-appropriated funds	1.0	0.3
Total	314.5	99.9

*In millions of dollars

Exhibit 4. Cost Comparisons of NPS & Peer Institutions: 2002

Institution	*Cost per Credit Hour*[1]	*Cost for 96 Credit Hours*	*Cost + 10-month Pay*[2]
Naval Postgraduate School	655	62,880	62,880
California Institute of Technology	724	69,504	183,767
Carnegie Mellon University	366	35,136	149,399
Georgia Institute of Technology	558	53,568	167,831
Illinois Institute of Technology	610	58,560	172,823
Massachusetts Institute of Technology	442	42,432	156,695
North Carolina State University at Raleigh	871	83,616	197,879
Purdue University (Main Campus)	540	51,840	166,103
Rensselaer Polytechnic Institute	1,320	126,720	240,983
Rice University	1,030	98,880	213,143
Rochester Institute of Technology	613	58,848	173,111
University of Southern California	891	85,536	199,799
Average excluding NPS	724	69,513	183,776
NPS Rank (out of 12, with 1 the lowest)	7	7	1

Exhibit 5. Resident Students by Academic School: 2003

School	*Navy*	*Marine Corps*	*Army*	*Air Force*	*International*	*Other*	*Total*
Graduate School of Business and Public Policy	98	50	14	8	59	34	263
Graduate School of Engineering and Applied Sciences	224	23	12	12	106	75	452
Graduate School of Operational and Information Sciences	176	88	59	23	153	84	583
School of International Graduate Studies	34	24	16	38	57	34	203
Total	532	185	101	81	375	227	1,501

Note. Eight students not listed in a school are omitted
Source: Office of the Registrar
– Average On Board

NPS Office of Institutional Research

TITLE

Naval Postgraduate School Frequently Asked Questions

SOURCE

NPS Internal Document, Author Unknown, 1998

ABSTRACT

The specifics regarding the Naval Postgraduate School program are reviewed, i.e., academic calendar, admissions criteria, and program length. Special emphasis is given the uniqueness of NPS in its ability to meet the Navy's needs for graduate education as reinforced by feedback from civilian professors, and graduates, as well as members of a select committee.

EXCERPTS

"In 1993–94, NPS invited distinguished academics from prestigious universities to review NPS programs for uniqueness … The overriding conclusions from this group of academics were that NPS programs are unique and that they could not be replicated at civilian universities without considerable expense."

"[US OPNAV] N81 using actual total costs of Navy graduate programs at civilian universities and at the Naval Postgraduate School, determined that civilian universities are 17 percent more expensive per class contact hour than at NPS. When other DoD/International/Foreign Military Training students numbers and tuition amounts are factored in, the cost per class hour at NPS is further reduced."

"At NPS, the Navy actually gets more for its dollar. For example, total graduate contact hours at civilian schools in a 12 month period equal 384 hours while NPS students receive 864 contact hours in that same period. This is due to NPS year-round operation and higher daily course loads."

"NPS instruction is designed to meet specific military Education Skill Requirements (ESRs) that reflect the academic theory that Naval officers will later apply in their careers. In order to do this, hardware, software, documents, etc. that are military specific are used … The intent is not to train officers for known challenges, but to educate them so they are capable of dealing with the unknown and the uncertain."

"In April 1991, speaking about NPS, Secretary of Defense Cheney said, 'The School is absolutely vital.'"

CD REF NO. PW–8

Naval Postgraduate School Frequently Asked Questions

IS THE NAVAL POSTGRADUATE SCHOOL REALLY UNIQUE?

The Naval Postgraduate School (NPS) is unique in several ways. First and foremost, it is unique in its mission and in the programs it offers to meet that mission. The NPS mission is to enhance the combat-effectiveness of the United States. Each program, and as much as possible, each course is focused on meeting that mission.

Other ways that NPS is unique include the following.

Classified Research

NPS has one of the largest classified library collections in the United States along with the facilities for conducting classified teaching and research.

Academic Calendar

NPS operates on a full year schedule with four academic quarters. Students enter and graduate each quarter. This facilitates the Navy's operating schedule and allows flexibility in officer assignments. Most graduate school curricula begin with the Fall semester with only a few allowing for January input.

Academic Potential and Officer Performance as Admission Criteria

Many graduate institutions only accept students with a 3.0 undergraduate grade point average in a field of study related to the intended graduate program. The average undergraduate GPA for USN officers is 2.87 and 54% of all USN officers have a GPA below 3.0. In addition to academic admission criteria, the Navy also values officer performance and potential, therefore NPS will accept officers with less than a 3.0 in majors not directly related to the graduate degree program.

Most top performing URL officers do not have an undergraduate degree in the correct discipline to qualify him/her for admission into civilian graduate school. Switching programs to CIVINS would make fully-funded graduate education unavailable to most of these potential leaders.

Transition Programs

The Navy has specific areas of study that it has determined to be critical to the success of the Navy of the future. At the same time, there is a closed pool of candidates with distinct undergraduate degrees and grades that the Navy must choose to educate. These two worlds do not always match. NPS has both the capability, and an impressive track record, of transitioning officers with one undergraduate degree to an entirely different, and often more technically oriented, graduate degree.

Program Length

Students at NPS generally spend an average of 23 months obtaining a graduate degree. This compares very favorably with programs at civilian universities. Navy Supply Corps officers spend an average of 22 months obtaining MBA's at civilian universities (compared to an NPS M.S. in Management, which takes anywhere from 18-21 months to obtain). Unrestricted and Restricted Line Officers spend an average of 33 months obtaining engineering degrees at civilian universities (compared to 26 months at NPS).

Interaction with Other Services and International Military Officers

For many officers, NPS provides the first opportunity in their careers for interaction with officers from other communities within their own service, other U.S. military organizations, and officers from other countries. NPS has a diverse student body, not only in terms of race, ethnicity and culture, but also in terms of different career backgrounds and experiences. The learning experience is further enriched as students share these differences both in and out of the classroom. The services and the United States are also enriched as relationships are formed which may serve to provide greater understanding and co-

operation in times of both peace and crisis throughout these officers' careers.

Professors in the Classroom

Civilian professors teach courses at NPS. Civilian schools make extensive use of Teaching Assistants and other graduate students.

Program Focus

The focus at NPS is on masters' students and on masters' theses. Masters' students are given the attention of the faculty; *the emphasis is first on teaching and second on research.* Top-level civilian institutions tend to focus on Ph.D. programs, concentrating on theoretical topics and neglecting practical application; *the first priority of the faculty at these schools is research.*

NPS students write theses on military topics with oversight from faculty experienced in working with military applications. NPS theses are valuable and timely contributions to operations within the DoN. It is unlikely that many students in civilian institutions would have the opportunity to write military theses, and it would be even less likely that they would have access to faculty members experienced in military applications. DoN has control over the quality of instruction and the integrity of graduate programs at NPS. Civilian graduate programs can vary greatly in quality from one school to the next.

HOW DO YOU KNOW NPS IS UNIQUE?

Navy Graduate Education Program Select Study Committee

In the mid-seventies, the Secretary of the Navy impaneled a Select Committee of distinguished civilian educators (including Donald Rice, former Secretary of the Air Force, William Perry, former Secretary of Defense), engineers, and scientists. The committee examined the educational goals and academic content of all Navy graduate education curricula and made specific recommendations as to their individual placement either at civilian universities or at NPS.

This commission found:

- that programs having a heavy emphasis on naval systems and those depending for their vitality on the unique facilities, services, talents and circumstances at the Naval Postgraduate School **could not be developed or offered at civilian institutions at equal or lower costs,** and
- that in the case of those few curricula offered at NPS for which counterparts are available at some civilian universities virtually all coursework is required to support other curricula, and that the incremental costs of offering these curricula is small and well worth the value of the benefits received.

The commission report noted that, "***a general comparison cannot he drawn between NPS programs and civilian programs under the same title.***" The report further states that, "*it quickly became obvious that most of the curricula now conducted at NPS contained a high degree of specialization to meet the needs of the Navy.*"

The Select Committee recommendations were accepted by SECNAV and CNO and have been implemented. The Committee also directed that NPS should not provide programs offered at civilian universities and the Navy and NPS have complied with that direction.

External Review of the NPS by Visiting Civilian Professors

In 1993–94, NPS invited distinguished academics from prestigious universities to review NPS programs for uniqueness. The reviewers were also asked to evaluate whether NPS students would have been accepted into applicable standard programs (i.e. engineering, business, etc.) at their universities.

The overriding conclusions from this group of academics were that NPS programs are unique and that they could not be replicated at civilian universities without considerable expense.

"From my perspective, your program is designed with different objectives in mind than most civilian programs and serves an important function that would not be easy to replicate. "Steven Long, Professor of Electrical Engineering, University of California, Santa Barbara: at NPS January 14, 1994.

"NPS offers a unique educational opportunity that would not be feasible to establish in a civilian, major research university." John R. Lloyd, University Distinguished Professor, Michigan State University: at NPS March 21, 1994.

"Without NPS, the Navy would lose control of their curricula. The curriculum sponsors would not get their requirements met." Professor Stephen Pollock, University of Michigan: at NPS May 23, 1994.

The visiting academics also reviewed the records of over 300 NPS students and found that only twelve percent would have been unconditionally accepted to civilian university programs. About 75% would not have been accepted without considerable additional academic preparation. The table below provides additional detail.

Individual Program Reviews

Late in the 1980's, the Review Committee for the Department of Operations Research stated: *"Both the comprehensiveness of the (OR) program, which is based on the assumption that most graduates will undertake no further graduate study, and its deeply military flavor are unique.* ***We do not believe that this military viewpoint could be maintained in any civilian academic institution, or that such an institution could provide its students with anything like the thorough survey of tactical, strategic, procurement, and weapon system problems offered in the program.*** *We therefore regard the OR curriculum at NPS as a major resource of the national military OR and defense planning community."*

In 1994, the head of the Air Force Special Operations School stated, *"The (National Security Affairs) curriculum at NPS, having been structured specifically to address the items of most importance to the military community, seems ideal for Air Force area specialists."*

Student Feedback

NPS graduates who have also taken graduate course sat civilian institutions were surveyed about the uniqueness, excellence, and relevance to DoD of NPS compared to civilian universities. Their overwhelming response has been that NPS is unique, excellent, and relevant.

WHY DOESN'T THE NAVY USE CIVILIAN UNIVERSITIES FOR GRADUATE EDUCATION FOR ITS OFFICERS? WON'T UNIVERSITIES TAILOR THEIR PROGRAMS TO MEET THE NEEDS OF THE NAVY?

Experience at NPS has shown that a powerful factor in motivating officers to undergo the intense study NPS programs require is the relevance of the course material. There is additional value added when course material includes applications to one's own environment along with the theory of a discipline.

NPS instruction is designed to meet specific military Education Skill Requirements (ESRs) that reflect the academic theory that Naval officers will later apply in their careers. In order to do this, hardware, software, documents, etc. that are military specific are used. The following are a few examples of topics covered and hardware used in courses and laboratories, some of which is classified and all of which are relevant to the military.

Harpoon seeker, Ada as a basic language, SPS-40C, SPS-67, etc. radars, AGM-78D antiradiation missile, SLQ-32 Electronic Warfare system, ALQ-123 IR counter-measure pod, JANUS and other war games, BGLCS logistics system, recruiting models, Heavy Attack planning and restocking model, Computer and Information Security laboratory, Classified reports library, SCI facility, ASSET and FAST ship design systems

Field of Study	Accepted	Possibly Accepted	Rejected	Total	Reviewer	Institution
Aero Engineering	6 (14%)	14 (32%)	24 (54%)	44	Dr. Thomas Adamson, Jr., Professor Emeritus	University of Michigan
Aero Avionics	2 (7%)	9 (32%)	17 (61%)	28	Dr. Thomas Adamson, Jr., Professor Emeritus	University of Michigan
Oceanography	1 (2%)	9 (14%)	53 (84%)	63	Dr. Nick Fofonoff Dr. Doug Caldwell	MIT/WHOI Oregon State University
Mechanical Engineering	9 (12%)	4 (5%)	65 (83%)	78	Dr. John R. Lloyd, University Distinguished Professor	Michigan State University
Electrical Engineering	18 (36%)	3 (6%)	29 (58%)	50	Dr. Steven Long, Professor	Department of Electrical Engineering, University of California, Santa Barbara
Computer Science	3 (5%)	3 (5%)	52 (90%)	58	Dr. Yale Patt, Professor	Department of Electrical Engineering and Computer Science, University of Michigan
Total	39 (12%)	42 (13%)	240 (75%)	321		

NPS makes continuous improvements to its curricula in response to needs of the Navy. NPS also develops new curricula (e.g. C4I, ASW, Space Operations, EW, Total Ship Systems Engineering, Operational Logistics, Combat Systems) in timely response to emerging Navy requirements.

While other universities are beginning to realize that there is a tremendous market in the development of tailored, focused curricula for a specific organization, corporation, or career field, NPS has been working with the Navy for years in this capacity. The term "corporate university" is being heard more and more often in the academic and corporate world. But, the Navy already has in NPS its own corporate university. While other civilian universities might be able to duplicate individual NPS programs, very few would be willing or able to duplicate all programs, or to respond as quickly as NPS does in modification of existing curricula or development of new programs. Evidence of this can be seen in the discussions by the visiting academics in the external review of NPS programs. Furthermore, the curricula that have been developed over the last several years are ones that are multidisciplinary in nature. NPS is uniquely qualified to provide these curricula as it can take advantage of existing in-house expertise. As a case in point, the Special Operations/Low Intensity Conflict (SOLIC) curriculum combines expertise in the areas of National Security, Operations Analysis, Command, Control, Communications, Computers and Intelligence (C4I) and Systems Management to create an analytically rigorous warfare-oriented program.

All of the things listed above in the section on NPS uniqueness are other reasons that civilian universities would not be able to meet the Navy's needs for graduate education.

DOES THE FACT THAT THE NAVY TIES THE REQUIREMENT FOR GRADUATE EDUCATION TO SPECIFIC BILLETS DRIVE GRADUATE EDUCATION MORE TOWARD TRAINING THAN ACADEMIA?

Department of Defense Directive 1322.10 requires that the services identify billets that requires education and educate officers to fill those specific positions. Each service developed its own system to ensure that they were meeting these requirements. For the Navy, this is the subspecialty system. Although this system tends to drive the Navy's management of the graduates of its fully-funded graduate education programs the same way it manages graduates of training programs, the system does not impact the education of those graduates in the same way. It simply cannot for several reasons.

NPS is an academic institution, which prides itself on the high-quality Master's level education that it provides. Ninety-nine percent of the permanent faculty hold doctoral degrees. They are experts in their field who work at NPS to provide quality education, not train naval officers.

Secondly, each subspecialty has hundreds of billets in dozens of commands throughout the Navy and DoD with a myriad of duties associated with these billets. There is no way to train students in the tasks required by each of these billets.

The subspecialty and curriculum review is where the transition between the skills required to perform in certain billets is translated into academic disciplines and learning objectives. The Navy curriculum sponsor brings to the review process descriptions of the billets and the duties required of those billets. Together with the NPS faculty, they develop a common core of skills required to perform well in those billets. The NPS faculty helps to translate those skills into knowledge areas and then develop courses to meet those objectives. The intent is not to train officers for known challenges, but to educate them so they are capable of dealing with the unknown and the uncertain.

ARE ALL COURSES AT NPS UNIQUE?

NPS programs are unique, however, not every individual course taught at NPS is Navy/military-unique. Advanced subjects cannot be taught without knowledge of science, mathematics, and statistics that underlie all science, engineering and technology programs. Professors use military examples where applicable in all courses.

IS SOME UNIQUENESS "CONTRIVED"? COULDN'T PROGRAMS SUCH AS MECHANICAL ENGINEERING BE TAUGHT ANY UNIVERSITY? DOESN'T THIS UNIQUENESS PERPETUATE ITSELF, SIMPLY BECAUSE THE PROGRAMS ARE CURRENTLY TAUGHT AT NPS?

Some curricula taught at NPS, such as Mechanical Engineering, have names that are the same as programs found at civilian universities. Those programs are unique because of their direct application to military systems and applications. The NPS Mechanical Engineering program includes courses in Naval Architecture and Marine Environmental Deterioration. Curricula with a heavy emphasis on naval systems and those depending for their vitality on the unique facilities, services, talents and circumstances available at NPS cannot be found elsewhere.

There is no question that NPS programs become more relevant with time. As professors conduct research for the Departments of Defense and Navy, and for other military institutions, they gain knowledge in areas directly applicable to defense. They, in turn, incorporate this knowledge into the classroom. They develop case studies, class projects and assignments, and course material based on their own knowledge and experience. Students also contribute to making the programs more unique through their thesis work and the real-world knowledge that they bring to the classroom.

The Select Study Committee on Graduate Education found that for the few curricula offered at NPS for which counterparts are available at some civilian universities, virtually all coursework is required to support other curricula, and the incremental costs of offering these curricula is small and well worth the value of the benefits received.

WHY DOES THE NAVY NEED ITS OWN GRADUATE SCHOOL WHEN NONE OF THE OTHER SERVICES NEEDS THEIR OWN?

Because of the unique operating environment of the Navy, educational opportunities are not as great in the Navy. If the Navy wants a mix of technical and non-technical then opportunities for fully-funded graduate education must exist. Because of the cost of the

officer's salary, this opportunity must be as compact as possible and focused. NPS, with its year-round operation, four times a year graduation and input, and its focus on corporate issues meets these needs.

Unlike the Air Force Institute of Technology (AFIT), NPS is used extensively by the other U.S. military services. NPS is the Department of the Navy's school, so it supports the graduate education needs for both the Navy and Marine Corps. The Army and Air Force have chosen NPS for all or most of their National Security Affairs, Management, Operations Research, Computer Science and Aeronautical Engineering curricula.

- Computer Science's Computer Graphics and Visual Simulation track has attracted Army students because of the non-availability at civilian institutions.
- The Army and Air Force have stated that they believe NPS fulfills their graduate education requirements in these areas.

In a letter dated 4 February, 1997, the Secretary ofthe Navy and Secretary ofthe Air Force discussed consolidation of AFIT and NPS. They recommended that NPS consider changing its name, mission and organization to emphasize its unique status. There was no mention of closing both NPS and AFIT, which implies that the services recognize the need for one graduate institution, dedicated to providing graduate education in areas of importance to the defense establishment.

In April, 1991, speaking about NPS, Secretary of Defense Cheney stated: "The School is absolutely vital."

WHY DOES IT TAKE ALMOST TWO YEARS TO COMPLETE A DEGREE AT NPS WHILE CIVILIAN UNIVERSITIES ADVERTISE SHORTER PROGRAMS?

Graduate students are accepted into programs at civilian schools if they are academically qualified for immediate entry into the applicable graduate program. This generally assumes that the student has the requisite undergraduate degree, a sufficient GPA, away from an academic environment no more than 3–4 years and performs well on graduate entrance examinations. If they are not qualified they cannot enroll directly in the program and must take additional courses to meet the entry requirements. Depending on the academic preparation of the student, they may be required to take one or two semesters of undergraduate preparatory work.

NPS students, for the most part, would not be qualified for immediate entry into graduate programs because of their time out of undergraduate school, GPA and/or their undergraduate major. NPS will accept students into the program and will "transition" them to qualified graduate students.

Additionally, NPS programs are designed to meet both degree requirements and fulfill educational skill requirements (ESRs).

NPS is working with the curriculum sponsors to develop shorter programs for unrestricted line (URL) officer students who are the ones who have the most difficulty finding time in their career paths for graduate education. Of note, URL officers attending programs at civilian universities spend an average of 24 months obtaining as degree, compared with the average 23 months spent at NPS.

CAN NAVAL OFFICERS, SPECIFICALLY URL OFFICERS, AFFORD THE TIME IN THEIR CAREER PATHS TO ATTEND GRADUATE EDUCATION PROGRAMS?

The answer to this question is yes, however, the question really should be, could the Navy afford not to invest in its URL officers by providing them the opportunity for graduate education? An OPNAV study revealed that there is time for graduation education early in an officer's career and recommended a continued long-term strategic commitment to postgraduate education for URL officers.

Although many officers believe that the time spent in a "Not Observed" status while attending graduate education programs will hurt their chances for promotion, statistics show that officers with graduate education promote at or above the rate of officers without graduate education.

ARE NPS PROGRAMS MORE EXPENSIVE THAN PROGRAMS AT CIVILIAN UNIVERSITIES? WHAT ABOUT OTHER NAVY EDUCATION INSTITUTIONS?

Using actual total costs of Navy graduate programs at civilian universities and at the Naval Postgraduate School, N81 determined that civilian universities are 17 percent more expensive per class contact hour than at NPS. When other DoD/international/Foreign Military Training students numbers and tuition amounts are factored in, the cost per class hour at NPS is further reduced.

A recent draft CNA study shows costs at NPS to be $89,000 for a 23 month program, $33,000 to $51,000 for a 10 month program at the Naval War College,

and $218,000 for a 48 month program at the Naval Academy. **When compared on a monthly basis NPS costs are $3870/mo, Naval War College costs are $3300 to $5100/mo and the Naval Academy costs are $4540/mo. NPS is not out of line when compared against other Navy schools.**

The cost-effectiveness of NPS is directly attributable to the efficient operation of NPS. NPS operational costs per student are extremely sensitive to the average number of Navy students onboard. Program costs are relatively the same whether you are educating five or twenty students. If the Navy sends fewer students in a year, the cost per student will go up accordingly. While NPS can respond to short notice changes, it takes several years to resize the faculty, staff and support structures accordingly.

When considering total cost to the Navy, the highest cost, approximately two-thirds of the total, is attributed to student salary and benefits, regardless of what school the student attends.

At NPS, the Navy actually gets more for its dollar. For example, total graduate contact hours at civilian schools in a 12 month period equal 384 hours while NPS students receive 864 contact hours in that same period. This is due to NPS year-round operation and higher daily course loads.

ARE NPS PROGRAMS AS GOOD AS THOSE AT CIVILIAN UNIVERSITIES?

Upon receiving the maximum length accreditation from the Accrediting Board for Engineering and Technology, "NPS was informed by the board president that NPS had the strongest review of any of the schools they visited that year" (1991).

President Bush's Science Advisor wrote about NPS: "What particularly impressed me, was the … unique mixture of outstanding fundamental science coupled to very clear, well-developed ideas as to how the science in question could be applied to specific Navy problems and applications."

The Degrees earned here (NPS) are "the equal of any being awarded. … anywhere … in the world …" National Science Advisor Dr. Allen Bromley: November 1989, Monterey, California

SHOULD MILITARY OFFICERS ATTEND CIVILIAN UNIVERSITIES TO INTEGRATE WITH SOCIETY?

There is a serious tradeoff between using graduate educational opportunities for integration of the military with society and providing tailored relevant curricula that will increase the combat-effectiveness of the officer and the Navy. As discussed above, the greatest cost to the service for graduate education is the student's time and salary. As civilian universities cannot provide the type of education that the Navy requires of its officers, it may not be prudent to sacrifice the educational needs of the officer corps for goodwill purposes.

The importance of the relationships made and the knowledge gained about the other U.S. services and officers of other countries by NPS students would be hampered, if not lost, should graduate education be transferred entirely to civilian universities.

DOESN'T THE FACT THAT NPS DEVELOPS CURRICULA IN RESPONSE TO THE NAVY'S NEEDS JUST ALLOW NPS TO PERPETUATE ITS OWN EXISTENCE?

The Navy has very specific procedures for identifying what education that it requires and where that education should be obtained. The directives read that a curriculum should not be taught at NPS if a program of comparable quality, focus and cost is available at a civilian university. NPS is not involved in the decision process about where a particular curriculum should be obtained.

However, as the experts in graduate education, NPS is often consulted on the development of new subspecialties and the curricula required to support these subspecialties. Moreover, it is often the case that Navy sponsors have an idea of what they want from a curriculum, and know that they will get the best product from NPS so they come to NPS for assistance in developing that product. Again, the Navy must ultimately decide where that education should be obtained, and NPS does not have the power to make that decision.

TITLE

Uniqueness and Excellence of the Naval Postgraduate School

SOURCE NPS Internal Document, Author Unknown, 2000

ABSTRACT

The benefits of the Naval Postgraduate School are outlined, including its programs structured to help combat terrorism, its student-faculty research on U.S. security requirements, and its outreach support to deployed forces. Also outlined are how NPS programs are structured by defense-relevant Educational Skill Requirements as specified by DoN and other sponsors.

EXCERPTS

"NPS' accredited degree programs are structured to help win the War against Terrorism from Afghanistan and Iraq to Hometown, USA."

"Navy comprises only 45 percent of NPS enrollment; growing flow of students from USAF, Army, and USMC. Unparalleled international enrollment: 303 students from 61 nations, many of them critical defense partners (US and International students are co-mingled in the classroom and in student housing)."

"UAV and network research (using NPS-controlled runways and airspace) has produced systems currently deployed by Special forces in Afghanistan."

"Dep Sec Def has designated NPS as the Information Operations Center of Excellence."

"Leadership Development for Sustained Peace (provides seminars for leadership of all divisions deploying to Iraq and Afghanistan on security-building challenges)."

"NPS costs reflect requirements imposed by Navy and others to meet operational demands and provide agile, adaptive and relevant programs."

"NPS meets military requirements while maintaining national academic reputations."

"NPS faculty includes PhD's from the nation's best universities including Harvard (9), Princeton (6), Yale (5), University of California (69), Stanford (25), MIT (14), Cornell (4), Columbia (3)."

CD REF NO. PW–9

Uniqueness and Excellence of the Naval Postgraduate School

NPS' accredited degree programs are structured to help win the War against Terrorism, from Afghanistan and Iraq to Hometown, USA

- SOCOM-Sponsored curriculum in Defense Analysis (including specialized Counterterrorism (CT)-oriented coursework)
- Stability Operations and Post-Conflict Reconstruction
- Homeland Defense and Security (the nation's largest and most successful)
- Computer Security, Information Assurance, and other critical infrastructure protection programs
- Blend of defense-oriented programs in technology, engineering, policy and management reflects agility and uniqueness of NPS

NPS student mix builds Joint, Combined, and Interagency effectiveness

- Navy comprises only 45 percent of NPS enrollment; growing flow of students from USAF, Army, and USMC
- Unparalleled international enrollment: 303 students from 61 nations, many of them critical defense partners (US and international students are co-mingled in the classroom and in student housing)
- Additional 160 senior defense officials from around the world attend leadership education in defense management
- NPS designated as the US' only NATO Partnership for Peace Education Center
- Strong interagency input (FBI, DHS, NSA, NSF Cyber corps, NRO and others)

NPS student-faculty research directly focused on US security requirements

- UAV and network research (using NPS-controlled runways and airspace) has produced systems currently deployed by Special Forces in Afghanistan
- Classified research in Maritime Domain Awareness, Intelligence, many other war-on-terrorism topics (heavy use of Special Compartmented Information Facility)
- Work in TBMD, Directed Energy, Counter-insurgency operations, Undersea Warfare, Combat Systems advance combat-effectiveness now and for the future
- Dep Sec Def has designated NPS as the Information Operations Center of Excellence

Outreach to support deployed forces, US policy-makers

- Regional Security Education Program (deploys NPS professors to conduct graduate seminars for Carrier Battle Groups sailing to operating areas)
- Leadership Development for Sustained Peace (provides seminars for leadership of all divisions deploying to Iraq and Afghanistan on security-building challenges)
- Homeland Security for Governors (seminars assist Governors in strengthening HS in their States — 22 programs already conducted)

- NPS offers 15 degree and certificate programs to over 600 off campus deployed forces, defense civilians and others working full-time in areas such as ASW, Information Systems, Systems Engineering, and Space Operations

- Mobile Education Team programs to over 50 countries per year to assist them in strengthening their CT and coalition warfare capabilities

- Provide operationally-relevant cultural knowledge and a real-time grasp of the indigenous environment to Marine personnel deploying for OIF III, including tactical scenario-driven knowledge of the Iraq dialect of the Arabic language

NPS costs reflect requirements imposed by Navy and others to meet operational demands and provide agile, adaptive and relevant programs

- Year-round operations with 4 inputs per year (gets officers back to operational positions ASAP)

- Refresher courses, other special support programs to enable success by students who would not gain admission to equivalent civilian institutions

- Program content and length driven by defense-relevant Educational Skill Requirements, outcomes, and objectives (as specified by DON/other sponsors)

NPS meets military requirements while maintaining national academic reputation

- NPS faculty includes PhD's from the nation's best universities including Harvard (9), Princeton (6), Yale (5), University of California (69), Stanford (25), MIT (14), Cornell (4), Columbia (3)

- The Dudley Knox Library at NPS has just been named by the Librarian of Congress as the best large federal library; it also serves as the Virtual Library for the Department of Homeland Security

- NSF-designated Center of Excellence for Information Assurance

- NPS programs accredited by regional (WASC) and specialized bodies including ABET; NASPAA and AACSB

NPS leverages the unique advantages of the Monterey region

- Undersea Warfare, Oceanography, and other education and research programs leverage co-location with other ocean research facilities including Monterey Bay Aquarium Research Institute, Stanford's Hopkins Lab, and the Fleet Numerical and Oceanographic Center

- NPS has priority claim (24–7) on use of 100 square KM of closed airspace at Camp Roberts in Monterey County, for UAV, network, other research

- Joint programs with Defense Language Institute (mutually supportive)

- Close linkages with Silicon Valley, NASA AMES, and Lawrence Livermore National Laboratory

TITLE

Graduate Education in the Department of the Navy
NPS: Value and Relevance • June 2000

AUTHORS

Admiral Henry H. Mauz, Jr.
U.S. Navy (Retired), President, Naval Postgraduate School Foundation
William R. Gates, PhD, Associate Professor, NPS

ABSTRACT

Due to severe budget pressure during most of the 1990s, many areas were cut causing shortages. The Department of the Navy, looking for ways to cut costs ,further commissioned studies to look for less costly graduate education than NPS. Questioning the value of an NPS education, Janice Graham recommends alternatives to an NPS graduate education, including vouchers, privatization and outsourcing. Mauz and Gates respond to her analysis and illustrate that NPS is cost competitive to civilian universities..

EXCERPTS

"Graham uses anecdotal evidence in asserting that the Department of the Navy does not value graduate education. In contrast to Graham's assertion, this article is based on the belief that most senior leaders in the Department of the Navy do place great value on graduate education."

"Graham further suggests that it is more cost-effective to meet these educational objectives by either privatizing or outsourcing NPS or giving officers educational vouchers … This depiction redefines the objectives for Navy-funded graduate education, confuses the link between delivery modes and educational outcomes, and bases cost-effectiveness conclusions on cost analysis that doesn't standardize across alternatives and ignores the cost of student salaries and benefits."

"Despite Graham's ideas to the contrary, NPS meets its currently defined educational objectives and is cost-effective after standardizing for program content … The previously referenced study by Cavalluzzo and Cymrot (1998) developed cost data (Integrated Postsecondary Education Data System (IPEDS). We have normalized that data … The average for the 28 civilian universities considered is $268,400. NPS' graduate education costs are $207,200, lower than all civilian institutions considered."

"One more attempt to put this whole debate in perspective. The annual budget of the Naval Postgraduate School is less than one tenth of one percent of the Department of the Navy's budget. It produces an overwhelmingly good return on that investment. Even so, the school is not about costs; it is about value."

CD REF NO. PW–10

GRADUATE EDUCATION IN THE DEPARTMENT OF THE NAVY

The Naval Postgraduate School; Value and Relevance

BY ADMIRAL HENRY H. MAUZ, JR. U.S. NAVY (RET)
AND WILLIAM R. GATES, PHD

SHORTAGE OF FUNDS HAS RAISED QUESTIONS ABOUT GRADUATE EDUCATION

The Department of the Navy has been under severe budget pressure for most of the 1990s. Reports from the fleet tell of shortages in people, spare parts, maintenance funding, and training opportunities. Today's much smaller fleet is chasing a multitude of commitments and operating tempo is higher than during the Cold War. There has been insufficient investment in things like ships and airplanes, and a tremendous bow wave of requirements looms on the horizon even to maintain the size of today's too small fleet. It is not surprising that the leadership in the Department of the Navy is looking for ways to cut costs in all "support" areas, including graduate education.

Graduate education in the Department of the Navy is mainly provided by the Naval Postgraduate School (NPS) located in Monterey, California. The cost of sending students to NPS has been under close scrutiny for some years to see if funds could be squeezed out of graduate education for other purposes. The Department of the Navy has commissioned several studies, referenced elsewhere in this article, to look for alternative ways to provide graduate education at less cost. For the most part, these studies are flawed for want of balanced analysis, inadequate research, and pre-ordained outcomes.

Janice Graham offers yet another view in her July *Proceedings* article "Rethinking Graduate Education in the Navy and the Naval Postgraduate School." Driven largely by her interpretation of the Department of the Navy's values and objectives for graduate education and her (mis)perception of relative education costs at NPS, Graham recommends education vouchers (redeemable at the student's school of choice), privatization and outsourcing as alternatives to NPS graduate education.[1] These recommendations seem to reflect the notion that one graduate degree will serve the department just about as well as any other, and from any source.

VALUE OF GRADUATE EDUCATION

What added value do officers with relevant graduate education bring to the Service? For the Navy, there is a long-standing "P-Code" system in place that identifies the billets requiring graduate education in specific academic areas. Those billets are almost entirely ashore and mainly in Washington. It is not the purpose of this article to take on the P-Code system, but doesn't it seem reasonable for a few officers serving aboard, say, an aircraft carrier or Aegis cruiser to have had graduate education in an area of practical value to the fleet? Every department head would certainly benefit from graduate work in virtually ANY curricula offered by NPS. More importantly, his or her ship or squadron would benefit as well.

The Fleets are trying to be more involved in the requirements process. NPS graduates will be increasingly important to fleet understanding of how systems work and are integrated into a larger whole. Upgrades and new systems are continuously being introduced, but few in the fleet have the background

[1] Graham states that "Initial forays to several top-tier private universities for the purpose of determining their interest in some type of partnership with NPS were most promising …" However, Graham does not provide any reference for this assertion, list the universities individuals contacted, or describe the ground rules specified for this partnership (e.g., student/faculty workloads; admissions timing, policies and requirements; curriculum content and review; etc.). As such, it is difficult to determine the actual interest level.

to fully understand and use them effectively. Even existing systems tax the technical competence of today's officer corps. While we can't educate everybody, there ought to be more than just a cadre of "button pushers" in the fleet. The point here is that, while the P-Coded billets ashore should be filled, there is a much larger requirement for graduate education than that dictated by the narrow confines of the P-Code system.

Graham uses anecdotal evidence in asserting that the Department of the Navy does not value graduate education.[2] In contrast to Graham's assertion, this article is based on the belief that most senior leaders in the Department of the Navy do place great value on graduate education. The entire Defense Department faces rapid changes in technology, new missions and evolving military strategy in the 21st Century. Navy and Marine Corps leaders recognize that education is a key to preserving maritime dominance in this environment. In point of fact, the Marine Corps has almost doubled the number of Marine students at NPS in the past several years.

WHAT NPS GRADUATE EDUCATION PROVIDES

In contrast to Graham's description, the mission and objectives of a Department of the Navy-funded graduate school are well defined. NPS' objectives are described in three sources: Title 10 U.S.C., Section 7041–7047 and SECNAV Instruction 1524.2A (April 4, 1989), the Chief of Naval Operations (CNO) "Vision Statement for Graduate Education" (May 5, 1999), and the Naval Postgraduate School vision statement (www.nps.navy.mil). Reflecting this guidance, NPS has, for over 90 years, provided graduates able to serve well in a wide variety of coded billets. These graduates have brought their education to the fleet as well, which is probably of even greater value to the Service in the long run. Besides honing graduates to fill specific jobs, there are other critical characteristics that distinguish NPS from civilian universities:

- NPS provides curricula that are militarily relevant, meeting Navy and Marine Corps subspecialty and general education requirements (the Navy has rejected the idea that a set of degree programs serendipitously chosen by its officer corps would meet Navy needs).
- NPS curricula are subject to biennial Navy flag-level sponsor review for military relevancy with the capability to swiftly implement desired course and program changes.
- Entrance to NPS is controlled by military performance and demonstrated aptitude rather than undergraduate grade-point average and standardized testing (e.g., GRE scores).
- NPS provides opportunity for able and motivated officers to transition from one undergraduate area to a different graduate major (unlike industry, the military cannot hire mid-career talent with the desired skill sets; it must educate them from within the ranks; e.g. Astronaut Winston Scott transitioned from an undergraduate music major to aeronautical engineering).
- NPS provides refresher courses to allow students to renew academic skills after several years of on-the-job performance.
- Faculty and students participate in over 500 reimbursably funded research projects per year on issues of interest to sponsoring (funding) agencies from the Department of the Navy and throughout the U.S. government.[3]
- The NPS student body combines junior officers from the Navy, Marines, Army, Air Force, National Guard, civilian defense agencies and scores of foreign countries to explore technical, operational and strategic problems.

This partnership among students, faculty and sponsors (curriculum and research) produces an unparalleled educational opportunity that is not available in civilian graduate programs. There are also important linkages between NPS, the CINCs and the fleets. If the Department of the Navy would want to replicate these attributes in civilian universities, it would have to establish Navy and Marine Corps programs under civilian control (requiring significant augmentation to civilian educational programs at universities or at NPS if outsourced or privatized). Navy Department leadership directly controls these attributes at NPS; they would have to be contractually specified in civilian universities, with questionable results.[4]

NPS' curricula include both technical and nontechnical fields. While many of these fields appear

[2] This point is also promoted in Linda C. Cavalluzzo and Donald J. Cymrot, "A Bottoms-Up Assessment of Navy Flagship Schools," CRM 97-24, Center for Naval Analyses, January 1998.

[3] This reflects the NPS FYOO reimbursable research program as of 1 June 2000.

[4] Graham observes that "… there does not seem to be a part of any curricula that could not be taught by a civilian university-if one was asked to structure and teach such a course for military students." While this is true, civilian universities are unlikely to provide military unique course material, or the other attributes NPS currently offers, if DoN students simply pay civilian tuition rates.

to have civilian counterparts, NPS curricula are uniquely tailored to Navy Department requirements. Each degree program satisfies civilian-sector degree requirements (as necessary to maintain accreditation) and Department of the Navy subspecialty requirements. For example, both NPS and civilian universities offer Masters' Degrees in Management. However, NPS programs in Contract Management and Manpower Systems Analysis include both the general material covered in civilian universities and Defense Department-specific issues. Contract Management includes Department of the Navy and Defense Department specific contracting policies, requirements and case studies. Manpower Systems Analysis addresses the software, databases and analytical techniques peculiar to military manpower analysis. Similar examples characterize every technical and non-technical degree program that NPS offers. There are other examples of synergy, such as the National Security Affairs Department being able to draw heavily on the presence of 250 foreign officer students from 5 I countries.

NPS curricula are responsive to Department of the Navy and curriculum sponsor direction in ways likely invisible to Janice Graham. For example, NPS significantly changed the electronic/information warfare curricula at the behest of VADM Arthur Cebrowski when he was N-6. NPS has also developed two new curricula specifically designed to meet the needs of unrestricted line officers. The first is Information, Strategy, and Operations, and the other is Systems Engineering and Integration. Both are IS-month master's degree programs which include Joint Professional Military Education. NPS offers a relatively new 18-month curriculum for Special Warfare Officers. It is an inter-service, interdisciplinary curriculum, sponsored by USSOCCOM. It was initiated under close scrutiny from USCINCSOC himself, and is very popular with the special welfare community. NPS has recently partnered with MIT in developing a breakthrough curriculum called Product Development for the 21st Century (PD-21). Students also have increasing opportunities to complete Professional Military Education Phase One during their standard NPS tour, from onsite Naval War College instructors. Finally, NPS is working with Navy sponsors and operational forces to provide distance learning, including both traditional NPS degree courses and graduate-level short courses.[5]

GRAHAM'S ALTERNATIVE MODEL

Graham's model for Navy graduate education emphasizes general educational skills, including entrepreneurial skills, better business practices and the basics of acquisition, the art of diplomacy and debate, computer literacy, culture and languages.[6] Graham does not properly analyze either the costs or benefits of subspecialty based curricula. She compares NPS' average annual cost per student to tuition costs at civilian institutions. This cost comparison is largely irrelevant.

COST EFFECTIVENESS OF DEPARTMENT OF THE NAVY FUNDED GRADUATE EDUCATION

Cost-effectiveness analysis must first consider educational objectives. If the Department validates subspecialty-based curricula, which it has, then the alternatives include NPS, outsourcing and privatization. If the Department were to adopt a general education model, the relevant alternatives include a restructured NPS and tuition payment to civilian institutions.[7]

Sub-Specialty Based Graduate Education: NPS, Outsourcing and Privatization

To consider outsourcing or privatization, private sector producers of graduate education must improve performance or reduce costs, resulting in better value to the government. OMB Circular A-76 provides detailed instructions concerning cost comparisons between government and commercial producers. These instructions emphasize the need to normalize for differences in outputs when comparing costs (Executive Office of the President, Office of Management and Budget (OMB), Circular A-76).

In comparing NPS' costs to the price civilian universities would charge to provide subspecialty-based graduate education, existing tuition rates do

[5] This is consistent with SECNA V Instruction 1524.2A, which states: "The objectives of graduate education at the NPS are to prepare officers to fill subspecialty positions … Graduate degree and non-degree (short courses) programs in technical and nontechnical fields shall be established by the Superintendent of the NPS in response to Navy and Marine Corps requirements."

[6] See also Cavalluzzo and Cymrot (1998) pp. 5–6, 63, 72-73.

[7] Of course, these alternatives are not equivalent substitutes. Restructuring NPS into fewer, broader curricula would increase the emphasis on general education while retaining some focus on DoN and DoD-specific issues. Sending students to existing civilian programs would lose all focus on DoN and DoD issues unless civilian programs were augmented by Navy-funded supplementary material. This would require considerable funding beyond tuition expenses.

not provide a meaningful comparison. Endowments and state/local tax financing subsidize civilian tuition. Civilian universities would likely view an outsourcing or privatization proposal as a business opportunity that they would enter if profitable. It is unreasonable to believe that civilian universities have excess endowment funds or tax financing to subsidize Department of the Navy graduate education.[8] Thus, the appropriate comparison involves total education costs at both NPS and civilian universities, *given a standardized educational offering.*

Unfortunately for ease of comparing "apples to apples", there are important differences between NPS and civilian universities. NPS' unique attributes that add to the cost of graduate education include:

- Military relevant graduate education that satisfies dual general education and subspecialty requirements.
- Institution devoted to graduate education (instruction by regular faculty; no teaching assistants).
- Academic scheduling with heavier than normal class loads.
- Quarterly admissions with demand driven course scheduling (courses scheduled to guarantee on-time graduation as opposed to minimum class size requirements).
- Thesis required in all degree programs, which increases relative intensity of faculty use.
- A military infrastructure superimposed on top of traditional academic infrastructure to maintain professional and military aspects of officer-student careers.
- Infrastructure to support classified courses, laboratories and student/faculty research.

All of these unique attributes increase NPS' average education costs per student per year relative to the standard civilian-sector model. Furthermore, educational costs are only a portion of the Department of the Navy's total graduate education costs; the Department pays the students' full salary and benefits while they attend in-residence graduate programs. These costs can be significant relative to educational costs. Salary and benefits are important to consider if graduate programs differ in duration. As discussed below, this represents an important difference between NPS and civilian universities. The most critical adjustments include: [9]

Academic Calendar and Course Scheduling The Navy and Marine Corps want every day of graduate education to count because an officer's time away from the fleet is precious. Thus, the typical NPS student receives 16 hours of instruction per week and attends class 48 weeks per year. This totals 768 hours of instruction per year. In contrast, civilian-sector graduate students typically receive approximately 486 hours of instruction per year if they attend summer classes (when course offerings are typically limited).[10]

Dual General Academic and Sub-Specialty Educational Requirements This analysis uses class hours as a measure of course content. While class hours are an input to the education process, they can be used as a measure for education as long as NPS and civilian faculty and students deliver and absorb material at the same rate. The average NPS graduate degree program requires 18 months and involves 1152 hours of class instruction;[11] civilian universities would require 28 months to deliver an equivalent course content.[12]

Focus on Graduate Education Graduate education is more expensive than undergraduate education. Larger undergraduate class size and instruction by graduate teaching assistants at civilian universities are at least two reasons to expect a significant cost difference. Graduate instruction and research also require more ex-

[8] Graham suggests that civilian universities might be anxious to share their endowments with DoN. She states, "High quality educational institutions normally have large endowments that could be of great benefit in maintaining and improving the physical and educational infrastructure at NPS." This is only possible if civilian universities enter outsourcing or privatization agreements out of a sense of public service, not as business opportunities.

[9] For a more complete discussion see William R. Gates, Xavier K. Maruyama, John P. Powers, Richard E. Rosenthal, and Alfred W.M. Cooper, "*A Bottom-up Assessment of Navy Flagship Schools: The NPS Faculty Critique of CNA's Report,*" NPS Technical Report NPS-FC-98-00 1, November 1998, pp. 11-22.

[10] NPS' heavier academic load makes sense because the Navy and Marine Corps pay these students full salary and benefits whereas graduate students at civilian universities may need a lighter load to allow time for temporary employment or other pursuits.

[11] Cavalluzzo and Cymrot, 1998. Alternatively, NPS and civilian university costs could be scaled to a 972 class hour civilian graduate program. Relative NPS and civilian costs are the same in either case; only the scale differs.

[12] Graham asserts that NPS' dual educational requirements increase degree program length at NPS relative to civilian universities. However, NPS' more intensive academic calendar allows NPS to satisfy dual education requirements without extending the graduate program length. Transitional and refresher courses have a greater impact on program length. These classes reflect Navy policy allowing students to enter NPS in fields outside their undergraduate major. This flexibility is essential considering the Navy's closed-pipe personnel system that precludes mid-career accessions in areas of Navy need.

pensive equipment and specialized laboratories, especially if students are required to complete a Master's thesis. This is particularly significant for technical graduate programs. One analysis found that graduate education in Washington, Florida and Illinois was two to three times as expensive as undergraduate education.[13] The analysis summarized in this article adjusts civilian university costs and assumes that graduate programs are twice as expensive as undergraduate programs.

Student Salaries and Benefits If NPS and civilian programs are of different duration (e.g., 18 versus 28 months as indicated above), any cost comparison must include the students' salaries and benefits. This is a significant portion of the total cost of graduate education for officers. The Department of the Navy Director, Assessment Division (N81) estimated that the annual cost of salary, benefits, and housing (referred to as MPN costs) per NPS-resident officer equaled $63,300, compared to $72,300 per officer-student at civilian institutions.[14] The higher civilian MPN cost reflects that NPS officers predominantly live in base housing.

The previously referenced study by Cavalluzzo and Cymrot (1998) developed cost data (Integrated Postsecondary Education Data System (IPEDS)). We have normalized that data for the effects of NPS' unique academic calendar and course scheduling, dual general education and subspecialty academic requirements, focus on graduate education and student salary and benefit considerations.[15] After making these adjustments, the present value of graduate educational costs per master's degree student range from $570,500 (California Institute of Technology) to $208,400 (University of Texas at Austin). The average for the 28 civilian universities considered is $268,300. NPS' graduate education costs are $207,200, lower than all civilian institutions considered. Student salaries and benefits are included in these figures and account for anywhere between 25% and 70% of the totals, with an average of 53%.

These results indicate that NPS is cost competitive with civilian universities after normalizing for NPS' unique aspects. Therefore, if the Department of the Navy retains its subspecialty-based degree program, which it believes it needs, it is unlikely that the total costs of in-residence graduate education would be reduced by outsourcing or privatization. In fact, NPS would look even more favorable in the cost comparison after adjusting for other cost-related unique attributes.[16]

This result is counter to the conventional view that average annual costs per student are greater at NPS than at a civilian institution. The primary explanation for this difference involves NPS student workloads relative to typical civilian graduate programs. Because student workloads are higher at NPS than at civilian graduate programs, both in terms of hours per week and weeks per year, and because higher student workloads use faculty more intensively, the average annual cost per student is increased. But the program's length *for a standardized degree program* is reduced considerably.

General Graduate Education: The Alternative of Restructuring NPS and Paying Tuition at Civilian Institutions

Even if the Department of the Navy were to adopt a general education objective, comparing NPS' current costs to tuition costs at civilian institutions is still meaningless. NPS' current costs reflect subspecialty-based graduate education. For comparability with civilian institutions, the Department would first have to develop a general education curriculum structure at NPS. This is beyond this article's scope, but we will offer some observations.

On the surface, cost-effectiveness of general graduate education at NPS is unlikely to compare favorably with tuition costs at civilian institutions. This is because tuition only covers a portion of educational costs at civilian universities.[17] Endowments and tax financing fund the balance. The Navy must pay all educational costs at NPS. Thus, civilian universities have a seemingly overwhelming inherent cost-effectiveness advantage. However, this advantage would be offset to some extent by NPS providing more class hours per year and flexible admissions timing. Returning students to the fleet more quickly reduces the associated stu-

[13] Peter D. Syverson and Moira J. Maguire, "Estimating Council of Graduate Schools, 1997.

[14] "Memorandum for the Deputy Chief of Naval Operations (Resources, Warfare Requirements and Assessments)," Ser N81/3U639949, 29 March 1993).

[15] Detailed calculations are described in Gates, et aL., 1998.

[16] For example, quarterly inputs and class scheduling to ensure on-time graduation reduce class size; maintaining military infrastructure increases administrative costs; and the thesis requirement increases faculty costs.

[17] Tuition covers between 13% and 73% of educational expenditures in the civilian university sample described above (Cavalluzzo and Cymrot, 1998, p.69).

dent salary and benefit costs by up to 40%.

Finally, as noted above, NPS admits students based on military relevant admissions requirements. Civilian universities consider undergraduate academic records, scores on the Graduate Record Exam (GRE) and, in some cases, relevant professional experience. Furthermore, civilian admissions committees balance demographic characteristics of their incoming classes. The prestigious programs often suggested as alternatives to NPS are not under-subscribed by civilian students. Thus, civilian programs would likely limit admissions to a very few of the most qualified Navy students. This would create problems for the Department of the Navy as it seeks quality civilian education for large numbers of service members. Of course, marginal schools that struggle to maintain enrollment would welcome large groups of Navy Department students willing to pay full-tuition. But Navy Department leadership should carefully consider the resulting tradeoff between cost and educational quality. It is noted that civilian universities are not ranked on costs, but on excellence of education. Why should the Navy Department's university be ranked otherwise?

CONCLUSIONS

Janice Graham provides one perspective on Navy Department-funded graduate education. Her suggestion that officers would be better served by a general graduate education that emphasizes entrepreneurial skills, public speaking, debate and better business practices simply does not meet the needs of the naval services. These may not be bad educational goals, and they might be included to some extent (if curricula sponsors so desire) in existing graduate education directed at Department of the Navy needs. Graham further suggests that it is more cost-effective to meet these educational objectives by either privatizing or outsourcing NPS or giving officers educational vouchers to attend the civilian institutions of their choice. This depiction redefines the objectives for Navy-funded graduate education, confuses the link between delivery modes and educational outcomes, and bases cost-effectiveness conclusions on cost analysis that doesn't standardize across alternatives and ignores the cost of student salaries and benefits.

The Department of the Navy's objectives for NPS graduate education are well articulated: NPS is to provide technical, analytical graduate education in a variety of subspecialty areas not available in civilian universities. NPS quickly adapts curricula to the sponsor's changing needs based on the flow of technology and a changing world. NPS' curricula are well regarded by the nation's higher educational community and are well-received and highly valued by their curriculum sponsors and by commands receiving NPS graduates. While many civilian institutions offer graduate education, none provide graduate education with the unique naval and defense characteristics that NPS offers.

Graham's article highlights the importance of providing more visibility to the great national resource that is the Naval Postgraduate School. If the school were better understood by some of the cost-cutters in Washington, there would be greater recognition that NPS produces the essential "seed corn" of tomorrow's educated officer corps. Despite Graham's ideas to the contrary, NPS meets its currently defined educational objectives and is cost-effective after standardizing for program content. Recent curriculum modifications also illustrate the value of retaining NPS' responsiveness and flexibility, attributes civilian universities cannot even contemplate.

One more attempt to put this whole debate in perspective. The annual budget of the Naval Postgraduate School is less than one tenth of one percent of the Department of the Navy's budget. It produces an overwhelmingly good return on that investment. Even so, the school is not about costs; it is about value. NPS graduates will have a significant and positive impact on the future of the Navy and Marine Corps. In fact, both services would be well served to examine more closely their requirements for graduates to serve afloat and ashore, and increase the number of students at NPS accordingly. All the studies in recent years, and related discussion of base closure, realignment, relocation, outsourcing, privatization, and so on, have had a corrosive effect on NPS, its faculty and even the students. Hopefully, those studies have now run their course. Let's get on with graduate education at NPS.

Admiral Henry H. Mauz, Jr. USN (ret) is the President of the Naval Postgraduate School Foundation, Inc. His last assignment on active duty was Commander-in-Chief, U.S. Atlantic Fleet. He retired on 1 November, 1994.

William R. Gates is an Associate Professor of Economics at the Naval Postgraduate School. He received a B.A. in Economics from the University of California at San Diego and a Ph.D. in Economics from Yale University. Prior to joining the NPS faculty, Professor Gates worked as an Economist at NASA's Jet Propulsion Laboratory and as a consultant to the Rand Corporation.

TITLE

Naval Postgraduate School Six Most Frequently Asked Questions • 2-23-04

SOURCE

NPS Internal Document, Author Unknown, 2004

ABSTRACT

Answers to why NPS offers the most effective graduate program for officers are explored. NPS' uniqueness and relevance are discussed, as well as its advantages over civilian universities. NPS' importance is further reviewed by the added value NPS-trained officers bring to their next command.

EXCERPTS

"NPS aligns with rapidly changing needs of military within DoD and Combatant Commands, percolating DoD themes, requirements and priorities down to NPS curriculum and research programs."

"Joint network-centric operations, joint warfighting and joint peacekeeping campaigns demand that officers know and work seamlessly with all branches of service and coalition forces. NPS supports rapidly changing military requirements through advanced graduate education for the Navy, Marine Corps, Army and Air Force, with jointness as a keystone."

"The highest priority at NPS is relevant education to military officers, an educational focus that cannot be replaced by Stanford or MIT. Combining basic and applied skills contributes to decision-making about future forces and warfighting capabilities. Example: NPS applied research recently supported a brief to Congress on Expeditionary Warfare Force Protection, which is now used widely in the military."

"…it is NPS, along with the Air Force Institute of Technology, that provide education across a broad spectrum of areas that are critical to combat-effectiveness as they provide officers with education that allows the conceptualization, development and use of weapons systems by our military forces. NPS provides a process-oriented education, with experience in integrated interdisciplinary research. A NPS graduate has a knowledge of diverse and innovative ways to attack a problem. Every graduate is required to write a master's thesis based on a real problem, finding real solutions with current and emerging technologies. This experience is invested back into the fleets and offices of DoD."

CD REF NO. PW–11

Naval Postgraduate School
Six Most Frequently Asked Questions

1. HOW IS THE NAVAL POSTGRADUATE SCHOOL UNIQUE?

Unique Mission

To provide relevant and unique advanced education and research programs that increase the combat-effectiveness of the United States and Allied Forces …"

Unique Vision

"Growing a new generation of leaders for tomorrow's military."

Unique Approach

- To educate joint and coalition officers as multidisciplinary military 'change agents"
- To equip future leaders to transform the military into a force that capitalizes on the advances and advantages of information management, network-centric operations, and other emerging technologies.

Unique Capabilities

- **Rapid responsiveness to DoD issues:**
  NPS aligns with rapidly-changing needs of military within DoD and Combatant Commands, percolating DoD themes, requirements and priorities down to NPS curriculum and research programs.
  Examples: NPS Center for Homeland Defense & Security — post 9/11 requirement for fast-track education to federal, state & city frrst responders. NPS Maritime Domain Protection Task Force quick response to DoD needs; C4l, ASW, Space Operations, Total Ship Systems Engineering, Seabasing, Combat Systems, Modeling Virtual Environments.
- **Joint Military and International Cross Fertilization:**
  Fertile intellectual environment for lifelong networking/interaction between within same service, other U.S. military organizations, and other countries.
- **Interdisciplinary Research and Education:**
  Courses and research are inherently interdisciplinary in nature; curricula optimizes existing in-house expertise.
  Examples: the Special Operations/Low Intensity Conflict (SOLIC) program combines experts in National Security, Operations Analysis (C41), Systems Management to create an analytically rigorous warfare-oriented program.
- **Classified Research:**
  NPS has large SCIF capabilities for conducting classified teaching and research, offers the largest classified library collections in the United States.

2. HOW IS THE NAVAL POSTGRADUATE SCHOOL RELEVANT?

Transformation

- The Secretary of Defense's highest priority is Force Transformation.
- Office of Force Transformation (OFT/SECDEF) sponsors a new program at NPS, consisting of a Transformation Chair, Transformation Education and Transformation Research.
  ~ Goals - to gain insights into current transformation in DoD, foster greater awareness of defense transformation internally with NPS faculty and students, and to a broad external audience of combatant commands & military stakeholders, equipping and influencing a new generation of DoD leaders.
  ~ NPS will be a broker for transformation research, whereby faculty and students world-wide can seek and share information on defense transformation and network-centric operations.
  ~ Offered both on campus and as short courses offsite.

Jointness

- Joint network-centric operations, joint warf-

ighting and joint peacekeeping campaigns demand that officers know and work seamlessly with all branches of service and coalition forces. NPS supports rapidly changing military requirements through advanced graduate education for the Navy, Marine Corps, Army and Air Force, with jointness as a keystone.
- The NPS student body is comprised of 42% Navy, 13% Marine Corps, 11% Air Force, 7% Army, and 24% international students.

3. WHY NOT USE CIVILIAN UNIVERSITIES FOR GRADUATE EDUCATION FOR ITS OFFICERS?

- Special curricula that combines basic research with direct military applications that respond directly to current military needs is not found in civilian universities.
- Defense focus not duplicated by civilian universities.
- The highest priority at NPS is relevant education to military officers, an educational focus that cannot be replaced by Stanford or MIT. Combining basic and applied skills contributes to decision-making about future forces and warfighting capabilities. Example: NPS applied research recently supported a brief to Congress on Expeditionary Warfare Force Protection, which is now used widely in the military.

4. WHY NOT EDUCATE OFFICERS AT THE AIR FORCE INSTITUTE OF TECHNOLOGY (AFIT)?

- Different mission than Air Force Institute of Technology (AFIT).
- NPS as joint corporate university is used extensively by the other U.S. military services.
- NPS has 1500 student officers in residence with a capacity for 2000, while AFIT accommodates 400 students with an Air Force focus. NPS responds directly to the specific needs of the Combatant Commanders and military through education, targeted research projects and theses. Students contribute to efforts in three NPS Institutes via multi-year integrated theme projects that generate real-time solutions to real-time problems. Examples are the Sea Basing study from the Meyer Institute of Systems Engineering and Analysis, whose technologies and approach are being employed throughout the military. Through the Cebrowski Institute the Battlespace Communications project works FORCEnet and netcentric issues for the Navy. MOVES Institute used cutting-edge gaming technologies to launch an Internet "America's Army" game that models infantry career paths in the Army, saving the Army hundreds of millions of dollars while increasing recruitment.

5. WHY NOT USE THE WAR COLLEGES OR NATIONAL DEFENSE UNIVERSITY?

- The War Colleges and NDU are not suited for the mission of educating junior and mid-grade officers in the scientific, engineering and technical areas essential to maintaining the combat-effectiveness of the Navy. The military academies focus on the development of leaders, the war colleges on the strategy and policies of war. But it is NPS, along with the Air Force Institute of Technology, that provide education across a broad spectrum of areas that are critical to combat-effectiveness as they provide officers with education that allows the conceptualization, development and use of weapons systems by our military forces.
- NPS provides JPME coursework on campus from dedicated War College faculty, so that officers can satisfy both their masters and military requirements from one location during a single tour.

6. WHAT IS THE ADDED VALUE TO THE FLEET OF AN NPS OFFICER WHEN THEY RETURN TO THEIR NEXT COMMAND?

Operations experience combined with and education

Officers apply their operational experiences gained in previous commands with applied military coursework and basic research on a master's thesis. A NPS graduate returns to duty with the "Why" (theory, computer modeling and simulation, problem solving, etc) in addition to the "How."

Broader world view

- Greater perspective than 4-year degree provides, gains the value of education
- Perspective on how the military works, the "business" of national security and defense
- Equipped with understanding of the new face of war and peace in the net-centric age
- Relationships/networks within 60 other countries and coalition forces

Approach to problem solving

NPS provides a process-oriented education, with experience in integrated interdisciplinary research. A NPS graduate has a knowledge of diverse and innovative ways to attack a problem. Every graduate is required to write a master's thesis based on a real problem, finding real solutions with current and emerging technologies. This experience is invested back into the fleets and offices of DoD.

TITLE

Rationale for Navy-Sponsored Education Prepared by N09BC

REF NO. N09BC, OPNAV Document, October 1995

ABSTRACT

Recognizing the importance of specially educated Naval officers to combat-effectiveness, this document builds a strong case for Navy-sponsored education. It reviews the five premises on which such an education is based, and stresses the Navy's commitment to professional military education, such as offered by NPS as a strategic, cost-effective investment in the future.

EXCERPTS

"Naval officers with the competencies (of) graduate education and professional military education meet the intellectual demands and challenges of their future careers. They can meet Navy unique goals that require intellectual flexibility; an understanding of the principles that govern in peace and war; and an ability to employ the analytical skills and perspective required for allocating and wisely using available resources."

"The Navy is in the higher education business because of the required focus on naval professional development, meeting the requirements of technological innovation, ability to exercise quality control, as well as optimizing Navy colleges capabilities for excellent teaching, professional competence, and professional interaction between students and teachers from a teaching/research perspective and cost-effectiveness."

"For the Navy, undergraduate, graduate and professional military education is an investment. Maritime supremacy requires a Navy-oriented perspective to meet the technical and professional challenges of the 21st century."

"To paraphrase the CNO, the intention of Navy undergraduates, graduates and professional military education is to prepare officers for a long career of contributions. This goal fosters the Navy ability to capitalize on new technology, management, and leadership linked to its level of officer competence. The flagship institutions combine excellence in the quality of their academic programs with responsiveness to change and innovation in the technology and management in the Navy."

CD REF NO. PW–12

Rationale For Navy-Sponsored Education

PREPARED BY N09BC. OCTOBER 1995

Navy-sponsored education is a cost-effective strategic investment in the future. Some may argue that if the Navy needs education why not rely on an expanded NROTC as feeder for officers with undergraduate degrees; executive professional development from any number of colleges and universities who sponsor these types of programs; and meeting graduate school requirements from the plethora of graduate sdlools in America. If the only goal were to provide education just for the sake of education, then an argument could be advanced for sending naval officers and Midshipmen to the many diversified colleges 300 universities in the United States. Under this arrangement, a further argument could be advanced that it might be more cost-effective to do so. But, the rationale for Navy-sponsored education is sound. particularly in this current era of cost-constrained resources and reduced budgets.

For the Navy, undergraduate, graduate and professional military education is an investment. Maritime supremacy requires a Navy-oriented perspective to meet the technical and professional challenges of the 21st century. The Navy's interest in this type of education is based on five premises: (1) enhanced and more effective accomplishment of its mission; (2) enlightened decision-making; (3) developed insights and broad perspectives for unique Navy tasks; (4) preparation for effective performance in high-level national security positions; and (5) quality control of the education process.

Enhanced mission effectiveness is developed and maintained with an educated officer corps who have experienced technical and subspecialty education and professional development not available through other educational institutions. Further, the research and study at the Navy's five flagship institutions support increased combat-effectiveness of the Navy and Marine Corps.

Enlightened decision-making is required to "manage the increased complexities in the technological, managerial and political-economic fields that affect the Navy. These factors require officers with a solid intellectual capability and the vision to capitalize on evolving technology and developments" (quoted from the CNO's Policy on Graduate Education. 1988).

Developed insights and broad perspectives for Navy unique tasks are components derived again from the CNO's Policy on Graduate Education, which makes explicit the requirement for "officers capable of original thought and the capacity to synthesize broad areas of knowledge, analyze complex issues, and appreciate the distinction between what is theoretically possible and actually achievable."

Preparation for effective performance in high-level national security positions is a requirement that Navy and Marine Corps officers face to become effective executives who can synthesize many disciplines relevant to different situations. This requirement seeks a balanced use of reasoning based on both academic and professional foundation.

Quality control of the education process is absolutely essential. The Navy Flagship institutions focus as academic institutions with an emphasis on programs relevant to Navy interests with an accommodation to the unique requirements of scheduling and sequencing officers into programs while maintaining academic excellence.

THE NAVY'S EDUCATION POLICY

Naval officers' careers consist of two distinct phases. The first phase (Ensign through Lieutenant) requires the mastery of a specific warfare specialty. Competency in this phase is developed from a combination of undergraduate education, technical service schools and significant on-the-job training and experience. The technical/scientific complexities of warfare systems and their support mandates that some officers pursue specialized technical and other postgraduate education that is related directly to identified requirements.

The second career phase (Lieutenant Commander onward) requires a knowledge of multidimensional naval and joint warfare, knowledge of the process for obtaining, allocating, and wisely using national resources, and a broad intellectual development to think better conceptually, especially with regard to strategy. Service college education (at Naval War College) prepares officers in this phase for the rest of their careers, whether in command, on the staff of large warfighting units, or participation in the processes of choosing and supporting future military forces. For officers who have not had the opportunity to pursue a postgraduate education, the Naval War College provides a capability to obtain a master's degree in National Security Affairs if the student is willing to expend an extra measure of effort while attending that insitution.

To paraphrase the CNO. the intention of Navy undergraduate, graduate, and professional military education is to prepare officers for a long career of contributions. This goal fosters the Navy ability to capitalize on new technology, management, and leadership linked to its level of officer competence. The flagship institutions combine excellence in the quality of their academic programs with responsiveness to change and innovation in the technology and management in the Navy.

The contributions of degree-granting flagship institutions to the combat-effectiveness of the Navy and Marine Corps reflect:

- An ability to develop and offer unique curricula while simultaneously meeting accreditation criteria.
- An ability to handle technical and strategic classified instruction and research.
- Flexibility in tailoring general educational subjects to the particular interest of the military.
- A capability to structure curriculmn and course sequences to meet professional needs and maintain officer warfare specialty with minimum time away from professional duties.
- The ability to meet DoN requirements rapidly and effectively by creating and adapting relevent programs and terminating obsolete programs.
- The benefit of bringing together officers from all the services and international military communities that increases the professional dialogue among officers in related efforts to solve significant military problems.
- The cultivation of a unique pool of specialized faculty whose teaching and research expertise is particularly relevant to the military.

NAVAL EDUCATION RESULTS

The increased effectiveness of naval officers is demonstrated by the high professional quality of its corps. These officers are required to bave the following competencies:

- Teclmical competencies
- Analytical capabilities
- Problem-articulating abilities
- Alternative solutions determination
- Solution-articulating abilities
- Abilities to extend themselves beyond the typical capabilities of undergraduate students through analysis and writing
- Demonstrated senior-level decision-making abilities
- Confidence in their own high-level professional abilities

Naval officers with the competencies graduate education and professional military education meet the intellectual demands and challenges of their future careers. They can meet Navy unique goals that require intellectual flexibility; an understanding of the principles that govern in peace and war; and an ability to employ the analytical skills and perspectives required for allocating and wisely using available resources.

SUMMARY

The Navy is committed to undergraduate, graduate and professional military education as a strategic investment in the future. Officer graduates are able to make the right decisions on national security equations. These officers must have the thoughtfulness, judgement, insight and abilities to adapt the past to the future.

Their education. unique to the technologies and professional requirements of the Navy, involves the process of clear, objective observation, persistent analyses, and tbe ability to deal with uncertainties, assessment of risk, postulating solutions, and measuring responses to them. These qualities and experiences are the essence of good higher education. The Navy, through its higher education institutions, has found this is the optimal way to provide insights for development and tasking for its future.

The Navy is in the higher education business because of the required focus on naval professional development, meeting the requirements of technological innovation, ability to exercise quality control, as well as optimizing Navy colleges capabilities for excellent teaching, professional competence, and professional interaction between students and teachers from a teaching-research perspective and cost-effectiveness.

TITLE

NPS: The Nexus of Advanced DoD and DoN Concepts

AUTHOR

CDR Porter, NPS Internal Document, March 2005

ABSTRACT

Reviewing a memorandum by Acting Under Secretary of Defense Michael W. Wynne, in which he explores criteria for closing or realigning military installations, the author cites the value of the militarily tailored curricula the Naval Postgraduate School offers versus civilian universities. Factors reviewed include NPS' programs developed to increase the combat-effectiveness of U.S. and allied armed forces and enhance national security, as well as the specialized institutions and programs NPS offers in, for example, civic-military relations, education for sustained peace, and counter-terrorism. Also cited are findings from "NPS: A Case for Value" (Proceedings 8/2000 issue) by Adm. Henry Mauz, Jr. (ret) which stresses NPS' superiority and cost-effectiveness versus civilian universities in offering responsive and effective military curricula.

EXCERPTS

"In the case of the Naval Postgraduate School, to make a closure decision primarily on cost considerations is to miss the very essence of what the school represents operationally, academically, and intrinsically to the Navy and to the Department of Defense."

"…a civilian course of study almost certainly does not represent the same tailored, defense-centric, militarily career-enhancing curriculum provided by NPS. This is a crucial flaw inherent in any cost comparison. Because, in fact, curricular requirements at NPS include Educational Skill Requirements (ESRs) dictated by the Secretary of the Navy that are intended to broaden the military student's educational experience … Based on these calculations, a degree at NPS would clearly cost the government less than the average cost associated with the 11 other peer universities cited above."

"In a recently updated version of his original article, ADM Mauz estimates the "cost" per credit hour at NPS by using the FY02 Operating Budget and the average number of students on board that year … the cost per credit hour at NPS is calculated to be $655. This number compares to an average of $724 at 11 peer institutions."

"NPS is the bridge to … Refined operational concepts to deliver the kind of dominant military power from the sea envisioned in Sea Power 21 … Sea Trial to increase levels of operational, organizational and technological agility…Sea Enterprise to increase the pace of innovation throughout our Navy … NPS is vital to DoD's interactions with other agencies and nations for national security. As has been shown, NPS' programs strengthen democratic civil-military relationships in countries throughout the world."

CD REF NO. PW–13

NPS: The Nexus of Advanced DoD and DoN Concepts

THE ABILITY OF OUR OFFICER AND ENLISTED LEADERS TO ANTICIPATE AND MANAGE THE CHALLENGES OF TOMORROW IS ONLY LIMITED BY OUR FORESIGHT TODAY

OVERVIEW

In his Memorandum dated 4 Jan 2005, Subject: 2005 Base Closure and Realignment Selection Criteria, Acting Under Secretary of Defense (Acquisition, Technology, and Logistics) Michael W.Wynne stated the following:

"In selecting military installations for closures or realignment, the Department of Defense, giving priority consideration to military value (the first four criteria below), will consider:

Military Value

1. The current and future mission capabilities, and the impact on operational readiness of the total force of the Department of Defense, including the impact on joint warfighting, training, and readiness.
2. The availability and condition of land, facilities, and associated airspace .
3. The ability to accommodate contingency, mobilization, surge, and future total force requirements at both existing and potential receiving locations to support operations and training.
4. The cost of operations and the manpower implications.

Other considerations cited in the Under Secretary's Memorandum included the extent and timing of potential costs and savings, the economic impact on existing communities in the vicinity, the ability of infrastructure of both the existing and potential receiving communities to support forces, missions, and personnel, and the environmental impact.

Judging by the priority of the Under Secretary's criteria cited above, it is recognized that cost savings is only one consideration of military value in deciding whether to close or realign an installation. In the case of the Naval Postgraduate School, to make a closure decision primarily on cost considerations is to miss the very essence of what the school represents operationally, academically, and intrinsically to the Navy and to the Department of Defense. And yet inevitably, this is the first criterion examined and, perhaps, the one most heavily weighted in the decision process. Despite the fact this does not seem in keeping with the Under Secretary's guidance, and as I hope to prove, would lead to the conclusion that closing NPS would be a costly mistake. Such an approach runs the risk of overlooking the TRUE value of the institution … one that has been named an Information Operations Center of Excellence by the Deputy Secretary of Defense, the Center of Education Excellence by the Commander of NETWARCOM, the U.S.'s only NATO Partnership for Peace Education and Training Center by former Secretary of State Colin Powell, and a "national treasure" by GEN John Abizaid, COMCENTCOM.

The Naval Postgraduate School represents the center of gravity of the US Navy's education strategy and is a critical enabler in DoD's Transformation, our own Human Capital Strategy, Sea Power 21, and the War On Terrorism. NPS may be one of our best tools to ensure the alignment of advanced operational concepts and technologies among the Department of Defense, Homeland Security, interagency, and international military partnerships. Rather than considering closure of NPS, we should be focusing on how to better maximize the return on our investment. These rewards could well include our Navy's preeminence in educating and retaining the most technologically advanced warfighters in the world, both officer and enlisted, and our military's assured superiority in Joint and coalition warfare for generations to come.

We can't afford to build tomorrow what we have today!

OUR INITIAL INVESTMENT

Originally established as a postgraduate department of the US Naval Academy almost 100 years ago, the Naval Postgraduate School moved to its current location in Monterey, California in 1951. The main campus is situated on 135 acres along Pacific Coast Highway that were originally purchased for $660,372 as part of a 627 acre buy. Today, NPS holdings include 620.5 acres, the original cost ofwhich totaled $1.3 million. The scenic location of this property and its proximity to other area academic institutions (Stanford University, University of California, Berkeley, University of California, Defense Language Institute), as well as Silicon Valley's powerful technological epicenter, make it difficult to appraise its current monetary value. But the intrinsic value of the location cannot be overstated in drawing some of the nation's brightest defense research professors, serving as a powerful incentive for junior and mid-grade officers (and perhaps one day for de greed enlisted leaders as well) to continue their service, and providing an a idyllic glimpse of America for international students from over 60 countries.

Operationally, NPS 's holdings in Monterey provide access to open ocean, ranges and uncontrolled airspace (as well as to a city that is an inspiration vice a distraction for students). If we close NPS, and disperse the students to civilian institutions or other military installations, we will lose these unique capabilities and we will never recover them. Our research faculty will likely migrate to other research universities taking with them unique skills and knowledge. In fact, finding other airspace, at an installation on the East coast for example, that will allow the 24/7 operation of UAVs at altitudes up to and in excess of 15000 feet will, most likely, be impossible.

OPERATING COSTS

In 2002 total expenditures/operating costs amounted to $314.5 million (37% of which covered student salaries, 21% went to research). This was balanced by a budget of $314.5 million which included $129.3 million for student salaries, $80.6 million for reimbursable academic costs, $48.8 million for direct academic costs, $27.4 million direct base operations, $17.7 million for reimbursable base operations, $9.7 million for military staff salaries, and $1 million for NAF. In 2003, sponsored program reimbursable expenditures (which include Research, Education, and Service Programs) exceeded $66 million, a 15% growth from FY02 (ranked by the National Science Foundation among the top 25% of institutions in total R&D expenditures). In 2004, $184 million of expenses (not including student salaries) were covered by $184 million total funding. This included Navy direct funding for $74 million (covering 40%) and reimbursable funding for $109 million (60%).

In attempting to compare apples to apples we miss the core differences!

A COMPARATIVE ANALYSIS

In an August 2000 article in *Proceedings* magazine entitled, "NPS: A Case for Value," ADM Hemy Mauz, Jr (ret) provided a comparison of the costs associated with a degree earned from the Naval Postgraduate School and a *similar* degree earned from a comparable civilian university. I have highlighted the word, here, because "similar" though the degrees may be when displayed on a sheepskin, and surely just as challenging in their pursuit, a civilian course of study almost certainly does *not* represent the same tailored, defense-centric, militarily career-enhancing curriculum provided by NPS. This is a crucial flaw inherent in any cost comparison. Because, in fact, curricular requirements at NPS include Educational Skill Requirements (ESRs) dictated by the Secretary of the Navy that are intended to broaden the military student's educational experience. For instance, NPS provides JPME coursework on campus from dedicated Naval War College faculty, so that officers can satisfy both their masters and joint military requirements during a single tour. Additional coursework is also required to ensure the student appreciates the military relevance of the academic subject material, thereby enabling immediate application upon rejoining the operational force. Hence, additional credit hours of instruction are built into NPS curricula to meet ESRs. Similar courses are not available at civilian universities and represent a hidden, but necessary, cost in NPS' budget.

Another "core" difference that must be acknowledged as part of any comparison is that civilian university admission criteria can not be trivialized. Besides the minimum 3.0 undergrad GPA required for most Tier One schools, and a requirement to do well on a graduate entrance exam (e.g GRE), graduate students are usually accepted for admission in the same field of study in which they received their undergraduate degree. This is not the case at NPS whose mission includes converting non-technical warfighters from the fleet (some of whom had relatively low undergraduate GPAs or have been away from3 academia for a number of years) into graduate students capable of earning technical degrees and applying this expertise in a highly complex operational environment. For example, 15% of NPS' engineering and science graduates had non-technical degrees at the bachelor's level. The truth is that many NPS students would not gain entry into Tier One schools whose entrance criteria are not meant

to consider the attributes of a combat warrior with proven leaderships skills, capable of managing complex weapons systems (a review by civilian universities of 300 Navy officers enrolled at NPS revealed they would admit only 12% directly and 13% with additional courses). No Tier One graduate schools would take non-technical students and admit them into technical degree program in the numbers required by the Secretary of Navy.

Further, each quarter NPS accepts new military students into its curricula. Most civilian institutions, on the other hand, work on a fixed academic calendar, so that if a student does not matriculate in the Fall, they cannot be admitted until the following year. Bearing operational demands in mind, particularly during this time of war, this loss of scheduling flexibility would have a significant impact on the number of military students capable of accommodating such a restrictive admission policy. But in his attempt to provide an "apples to apples" comparison, ADM Mauz focuses our attention on a more profound difference between NPS and civilian universities that has a significant impact on the cost of earning a degree.

In his article, ADM Mauz explains that the academic ops tempo at NPS is significantly greater than that of a traditional civilian university. At NPS, the academic school year is based on four, twelve week quarters consisting of 16 classroom hours per week.

Although academic calendars vary at civilian universities, typically students attend classes 13 hours a week for 32 weeks of the year, and may attend a ten week summer term for seven hours a week. This amounts to approximately 58% more student-faculty contact hours per academic year at NPS than at a typical civilian university. Carrying this line of reasoning out to its logical conclusion, ADM Mauz demonstrates in his article that a student at NPS would conclude his Master's degree coursework in approximately 18 months, or 6 –10 fewer months than would have been required at a civilian university.

In a recently updated version of his original article, ADM Mauz estimates the "cost" per credit hour at NPS by using the FY02 Operating Budget and the average number of students on board that year. He calculates the total instructional cost by adding the direct academic cost ($48.8 million) to the fraction of direct base-operations costs attributable to non-reimbursed academic functions ($27.4 million times 48.8/185.2, which is the total expenditures minus $129.3 million in student salaries) for a total of $56,019,869. By dividing this total instructional cost by the average number of students on board in FY02 (1336), and by 64 credit hours per year (16 per quarter), the cost per credit hour at NPS is calculated to be $655. This number compares to an average of $724 at 11 peer institutions (including Cal Tech, Carnegie Melon, Georgia Tech, Illinois Institute of Technology, MIT, NC State-Raleigh, Purdue, Rensselaer Polytechnic, Rice, Rochester Institute of Technology, and USC). At $655 per credit hour, NPS ranked seventh among these universities. However, the point of this exercise was to demonstrate the difference in cost over the duration of coursework needed to earn a degree.

Returning to ADM Mauz initial assertion, we'll recall that based on a more aggressive academic calendar, an NPS student could earn a degree (requiring 96 credit hours) in 18 months vice the 24–28 months that would likely be required to complete 96 credit hours of coursework at a civilian university. Therefore, to compare the costs of a degree, six to ten additional months of the student's military salary would have to be added to the nominal tuition fee at a civilian university. Based on these calculations, a degree at NPS would clearly cost the government less than the average cost associated with the 11 other peer universities cited above.

Other studies completed recently estimate the average cost of a graduate degree from a civilian university to be approximately $27,000 per academic school year (9 months). Bearing in mind that tuition represents only a fraction of total costs (70–80% of the total costs at a civilian university are compensated by state, federal, or private endowments and research), we must consider the points made above regarding credits contained in one academic year at a civilian university. Hence, based on the 24–28 months required to earn a Masters degree at a civilian university, without meeting Educational Skill Requirements, it is fair to estimate total tuition fees of approximately $72,000 (2.6 x $27K). An academic school year at NPS (12 months) was recently estimated to cost approximately $36,000. But, again, based on the more rigorous academic calendar at NPS, a degree would take only 18 months to earn (excluding an estimated 4.8 months additional time required for transition and refresher courses). Even by adding the costs associated with the additional 4.8 months (which would not include a full academic load), a student would earn a tailored degree, would produce a defense-related thesis, and would meet all Educational Skills Requirements in under two years, for less than $72, 000 (< 2 x $36K).

It should be noted that this cost comparison did not consider varying housing allowances from region to region. Therefore, drawing the conclusion from the analysis cited above that the cost of a similar degree at a comparable civilian university would be signifi-

cantly higher than at NPS, another cost analysis is suggested: how much would be saved by moving NPS to an existing military installation in a less expensive geographic area? It could be argued that the same rigorous academic calendar would be in place, so that not only would the degree be completed in the same amount of time as currently done at NPS, the cost of living would be lower for the student and his or her dependents. But here, I return to an earlier point: making a closure, or realignment, decision primarily on cost considerations is to miss the essence of what NPS represents operationally, academically, and intrinsically to the Navy and to the Department of Defense.

Operationally and intrinsically, Naval Postgraduate School is a model environment for military academic excellence and a showcase of American values for international students. It should serve as an incentive for our best and brightest officers and enlisted personnel who seek graduate degrees to enrich and enhance their military careers and improve their post-career job prospects as well (in fact, many of these students should be encouraged to pursue defense-related employment upon retirement from the service, thereby bringing their extensive military experience and graduate education into government or private sector defense-related fields). NPS also imprints a strong positive impression of America and our military on international students, many of whom will go on to be senior leaders, with considerable influence, in their own militaries. Fond memories of NPS and the friends with whom they studied there will pay further dividends on our investment through stronger collective security partnerships in the future. The King of Jordan, the Turkish Chief of Naval Operations, and the Chief of Staff of the Israeli Air Force are among the international alumni of NPS.

The location of NPS adds intrinsic value to the school and increases the potential return on our initial investment. While the cost of operating a military postgraduate institution in a less costly economic area than Monterey would probably save money in housing and some direct operating costs, what would be the second and third order effects of such a move? Would a school in a less attractive and academically dynamic environment draw research academicians with degrees from the same prestigious universities as are represented today by the faculty of NPS (among tenured-track faculty, terminal degrees are held by three or more faculty members from Stanford, MIT, Harvard, Yale, Purdue, Princeton, Penn State, Cornell, Northwestern, Rensselaer, The University of California system, and more)? Further, what would be the impression of a less attractive and culturally stimulating environment on our international students? And perhaps most importantly, what message would this send our Navy family, who so often trades inconvenience and quality of life for the opportunity to serve? The postgraduate experience should be enriching both academically and socially. With the capital investment we have made in Monterey, California, we can offer the finest quality of life for our students and their families as an indication of our commitment to them and to their futures. They will repay us with their energy, resourcefulness, and innovation.

And finally, hypothetically, what if we could find a civilian university willing to offer a degree in an accelerated timeframe so that we could avoid paying the additional costs associated with a "typical" civilian academic regime? While a civilian university might come close to equaling some of the intrinsic value associated with NPS, the vital operational aspects of the curriculum (including the Educational Skills Requirements) would be missing. Professors would generally not have the extensive defense-related experience common among the NPS faculty, nor could they be expected to demonstrate military applications of their subject matter. Student/faculty contact hours would be less (NPS was ranked near the top of the 11 peer universities mentioned in this category) since civilian universities routinely use graduate assistants to teach some graduate-level courses, and university research would not be 85% defense-related as it is at NPS. The academic environment, while perhaps representing a refreshing change for military students, would tend to take minds away from the challenging operational applications of their course of study. In fact, the opportunity to work with other service members and with international military students would be largely lost. As would the ability to introduce foreign officers to a challenging and enriching glimpse of what their military futures could hold. The return on investment in sending military students to civilian universities for the United States Navy and program sponsors would be far less then it is in the defense-centric environment at NPS.

If our task was to design a graduate university to prepare America's young military leaders for the dynamic challenges and opportunities of a vastly different tomorrow it would be joint and international, have diverse defense and interagency related curricula, be held to the highest academic standards, taught by professors experienced in advanced military research. It would be cost-effective and offer the highest level quality of service needed to draw and keep our best …

NPS IS THIS AND MORE …

While enrollment fluctuates somewhat throughout the academic year, in the summer of 2004, the NPS student body was comprised of 42% Navy, 14% Marine Corps, 13% Air Force, 8% Army, 5% other US agencies, and 18% international students (291 residents from 57 countries). By 2006, 1800 military officers, defense civilians, enlisted, defense contractors, and other agency representatives from the United States and other nations will be studying in resident programs at NPS. Another 4,000 or more students will be enrolled in degree or certificate programs around the world.

Joint

NPS works closely with the Unified Combatant Commanders to provide relevant education and research critical to the combat mission. NPS faculty provides about $75 million of research to the Navy, Unified Combatant Commanders and the Services. Examples of support to the Combatant Commanders in 2002-2003 included:

- Homeland Defense and Security programs for Northern Command and Pacific Command.
- Counterterrorism programs in support of Unified Combatant Commanders' initiatives.
- NPS faculty and students' direct support to Millenium Challenge 02 for Joint Forces Command.
- A Special Ops curriculum and related research on UAV's, tactical decision aids, and other warfighting advances for SOCOM.
- Information Security for Strategic Command.
- Graduate education for National Guard division staffs deploying to European Command (and NATO) op areas.

International

The Center for Civil-Military Relations (CCMR) at NPS is dedicated to strengthening democratic civil-military relationships and assisting other nations in making integrated defense decisions. Courses are offered across the country, overseas, and in-residence. Each quarter, CCMR runs 20 to 30 events in more than 20 nations, reaching over 8000 civilian and military personnel each year. From October through December 2004, CCMR held 25 events, both in residence and non-residence, teaching civilians and military from 28 nations, including Azerbaijan, Slovenia, Latvia, Bosnia, Kosovo, Romania, Columbia, Fiji, and others. These events ranged from two-day site visits to two-week seminars. Naval Postgraduate School professors and instructors taught these courses/seminars.

The Leader Development and Education for Sustained Peace (LDESP) program is a component of CCMR. This graduate-level education program serves the education needs of professionals from various disciplines and/or agencies such as ambassadors, former political officials, former military commanders, security and international law enforcement personnel, community leaders, and United Nations and State Department personnel. LDESP prepares units deploying to stability operations in Central Europe, Central Asia, the Middle East and Africa. Recent activity (late 2004) focused on prepanng senior leaders/U.S. units for their deployments to Iraq, Afghanistan, and Kosovo.

The Defense Resources Management Institute (DRMI) is an educational institution sponsored by the Secretary of Defense and located at NPS. Since 1965, DRMI has conducted professional education programs in analytical decision-making and resource management for military officers of all services as well as senior civilian officials from the United States and 125 other countries. The courses can be studied either overseas or in-residence. The principal focus of all DRMI programs is to develop an understanding and appreciation of the concepts, techniques, and decision-making skills related to defense resource management. The emphasis is not on training in job-specific skills, but rather to understand the concepts, techniques, and issues that pervade defense resources management decision-making.

In 2004, DRMI's Mobile Education Team (MET) held courses in: Macedonia, Guatemala, Honduras, Argentina, Thailand, Tajikistan, Malaysia, Belize, Lithuania and Bosnia. In 2005, DRMI's MET plans to hold courses in: Guinea, El Salvador, Columbia, Honduras, Bangladesh, the South Pacific, Indonesia, Malaysia, Mexico, Estonia, Argentina, Canada, and Latvia.

Interagency, National Security

NPS provides specialized programs that support U.S. national security priorities, including counterterrorism, homeland security, and security cooperation. Master's degree programs and seminars have been developed on Homeland Defense and Security, as well as Counter-drug Strategy and Policy, for the Department of Homeland Security (and for the Chief ofNaval Operations, NORTHCOM, and the National Guard). NPS teaches a classified graduate education program for the National Security Agency, is a University of choice for the National Reconnaissance Office, and NASA sponsors the annual Michael J. Smith NASA Chair at NPS with focused areas of space research, education and training for future astronaut candidates. Additionally, NPS receives sizeable annual funding from the National Science Foundation for basic research in oceanography, meteorology, information sciences, engineering, and technology development, often partnering

with other universities on interdisciplinary research projects.

"Prevail today while bridging to a successful future." CNO Guidance for 2005

NPS IS THE BRIDGE TO …

"Refined operational concepts to deliver the kind of dominant military power from the sea envisioned in "Sea Power 21"." Operations Logistics faculty and students are conducting research on how to use of High Speed Vehicles (HSVs) in a logistics role for CTF–73 and how to modify contingency support plans. Twenty Systems Engineering and Analysis students are leading a campus-wide integrated study on defeating maritime terrorism and pirate-supported terror in the Southeast Asian waterways; NPS students from Singapore will be integrated into this study. Thirteen Systems Engineering and Analysis students will lead a campus-wide integrated study on the challenges of Undersea Warfare in the Littoral. This work will focus on the most relevant threats and will involve coordination with COMPACFLT, ASW Command, and TF ASW. The estimated completion date is December 2005.

"**Alignment** to best organize our personnel and resources across the Navy to support the Fleet, training and education of our personnel, and the synergies of our various echelon levels." NPS' Regional Security Education Program (RSEP) raises the strategic situational awareness of deploying and forward-deployed naval forces, thereby enhancing force protection and mission performance. The RSEP sends teams of regional security experts to ships and forward bases where they brief unit personnel on the strategic, political, and cultural contexts in which they will operate. RSEP teams typically remain on site for several days where they conduct briefings as well as informal discussion sessions. An RSEP team was onboard the Lincoln Strike Group as they deployed to the Persian Gulf, where the team provided staff and crew with counter-terrorism and Middle Eastern political, military, and regional orientation.

"**Sea Trial** to increase levels of operational, organizational and technological agility." Students in the Systems Engineering and Analysis curriculum completed a nine-month study of Sea Basing and Joint Expeditionary Logistics for the 2015 to 2025 time frame. The integrated multidisciplinary project was completed by a team of 50 students and 20 faculty from across campus including the Systems Engineering Analysis and Total Ship Systems Engineering curricula. One student helped develop a prototype map-based system to automatically display, animate, and statistically analyze situation reports about insurgent activity (including Improvised Explosive Device or IED attacks) from Operation Iraqi Freedom. The student applied statistical process control techniques developed by his thesis advisor and XML technology developed by his second reader to display and analyze SIGACT data, providing early warning of shifting enemy patterns.

"**Sea Enterprise** to increase the pace of innovation throughout our Navy." NPS has been a leader and an active participant in the Navy's efforts to develop future naval technologies. NPS researchers took part in the Silent Hammer exercise that tested submarine control of a long-endurance UAV to support forces on land, and NPS physicists have conducted pioneering research on shipboard free electron lasers and electromagnetic rail guns while guiding student thesis research on these topics in order to develop military leaders familiar with these future technologies. In another thesis, a student created a theater ballistic missile defense (TBMD) operational planning aid that helps the Area Air Defense commander create courses of action to best locate TBMD assets. The model, JOINT DEFENDER, which can also be used in programmatic development for evaluating cost/benefit of new technologies, has been briefed to NWDC, CNO N-76 and STRATCOM and is being evaluated for inclusion in a standard suite of TBMD models.

"**Sea Warrior** to empower our people with a lifetime of learning, with technology that is integrated with the human being, and with more choices and incentives in a competitive career environment." NPS is partnered with many defense and civilian universities. These partnerships, which allow NPS to deliver defense-related education when and where it is needed, include the Air Force Institute of Technology (AFIT), Stanford University (for Homeland Security). NPS is currently running 11 non-resident degree programs, 85 on-line courses, 4 Navy-relevant distance learning certificate programs, more than 300 courses using web technology, 5 online distance learning courses on board ship, 215 locations for distance learning (via video teleconferencing, internet, satellite campuses, etc).

"We will continually adapt how we approach and confront challenges, conduct business, and work with others." National Defense Strategy, March 2005

NPS: A TOOL FOR TRANSFORMATION

The Office of Force Transformation now sponsors an NPS Chair and course development in one of the first programs in Transformation Education and

Research, through the NPS Cebrowski Institute of Information Innovation and Superiority. The new "National Defense Strategy's" section on Defense Transformation states that,

> "Transformation is not only about technology. It is also about:
> - Changing the way we think about challenges and opportunities
> - Adapting the defense establishment to that new perspective, and
> - Refocusing capabilities to meet future challenges, not those we are already most prepared to meet."

It goes on to say that, "We are working to transform our international partnerships, including the capabilities that we and our partners can use collectively."

NPS is vital to DoD's interactions with other agencies and nations for national security. As has been shown, NPS programs strengthen democratic civil-military relationships in countries throughout the world. The "National Defense Strategy" plainly proclaims a goal fully supported by the Naval Postgraduate School, "We seek to foster a culture of innovation."

NPS: NAVY EDUCATION STRATEGY'S CENTER OF GRAVITY

As a matter of national security, the Navy needs to do a better job of managing the careers of our young warfighters. We must develop an education strategy that builds postgraduate education into the career paths of our officer and enlisted leadership as both a reward and an incentive. There is no better military environment in which to earn a postgraduate degree than the Naval Postgraduate School with students representing all services, several US Government agencies, and more than 60 countries. This is the future operational environment: technology serving joint, interagency and combined operations worldwide. Further, we need to think of all our Navy family, uniformed and civilian, and their dependents. Through distributed distance learning we can provide the means to develop draw the best and keep the best happy.

Naval Postgraduate School represents the beating heart of the Navy's future Human Capital Strategy. We truly must "Win in the marketplace for talent." We can only do this by investing in and demonstrating a commitment to the education and training of our people. From their recruitment, to their retirements, and beyond into our nation's workforce, we must provide the opportunities for our leaders to excel: personally and professionally. Sadly, fewer American's are seeking technical degrees in college. Many officers with non-technical degrees are asked not only to be leaders, but to work in a highly technical environment with sophisticated weapons systems. Our enlisted sailors who demonstrate a technical aptitude are likewise trained to perform highly complex tasks in a stressful environment. In fact, more and more of our enlisted sailors (and soldiers, airman, marines) are entering the service with degrees or pursuing degrees via distance learning. Having demonstrated the maturity and capability of performing the most exacting jobs in the most stressful conditions, our warriors have earned the right to learn more, to progress educationally. They deserve the opportunity to fulfill their career goals both in the service and after they leave the service.

In the next year, the Defense Department needs to hire more than 14,000 civilian scientists and engineers. But the pool of candidates is shrinking. More than half of science and engineering graduates from American universities are foreign nationals, who are mostly offlimits to federal agencies. Moreover, DoD must compete with the private sector and other agencies for the talent that is available. Naval Postgraduate School is ninth in the nation in the production of science and technology Master degrees. In fact, NPS is graduating 18–20 civilians a year to serve in all agencies of the government. By developing an education strategy built upon continuing education, career management and counseling, we can ensure our nation has technically qualified and innovative sailors, soldiers, airmen and marines who are capable and willing to carry their experience and education into the civilian work force when they retire.

Naval Postgraduate School is ideally placed to serve as the centerpiece of a Navy Education Strategy that takes a total force, lifelong approach to serving our Navy family and our nation's defense needs.

TITLE NPS Strategic Communications Plan

SOURCE NPS Internal Document, 3 October 2006

ABSTRACT The plan details the Naval Postgraduate School's key messages to be promoted, including how NPS differs from civilian universities and reinforces NPS' mission. The plan's audiences are outlined, as well as how NPS community members need to be involved in carrying out the plan. Communication methods and implementation are also defined.

EXCERPTS

"NPS education and research programs are of the highest quality. Our faculty are recruited from, and sought after by, the best universities in our nation and abroad. Our students are accomplished professionals with tremendous career potential who take with them both academic as well as joint and combined military professional education credentials."

"Accomplished NPS faculty, both civilian and military, integrate graduate education objectives of the Armed Services with relevant research at the applied and theoretical levels into degree programs and student theses and dissertations of great value to our nation and international partners."

"To advance the vision and capabilities that NPS brings to the Department of the Navy, Department of Defense, interagency and the nation, each contributor to implementation of this Strategic Communications Plan will understand its objectives and assist the Institutional Advancement Department with coordinating and orchestrating their individual and combined efforts to achieve NPS, DoN and DoD objectives for the 21st century."

"When properly orchestrated, individual, School, Institute, CEE and combined efforts can ensure DoD-wide coverage for NPS on an annual (or semi-annual) basis as well as synchronize efforts to meet with and brief critical interagency and foreign partners."

"As the central focus of this Strategic Communications Plan, enthusiastic marketing of NPS and the potential of our faculty, students and graduates is everyone's responsibility."

CD REF NO. PW–14

NPS Strategic Communications Plan

3 OCT 2006

"A View to the Future" calls for a coordinated strategic communication plan for synchronized and effective outreach to potential students, alumni, research partners and Armed Services who are the consumers of our products, both nationally and internationally. Effective and orchestrated communications at all levels: leadership, faculty, students and graduates are essential for us to accomplish this mission. The purpose of this plan is to ensure that everyone understands the messages to be communicated, the audiences, the methods and the responsibilities for coordinating communications.

NPS MISSION

Provide relevant and unique advanced education and research programs in order to increase the combat-effectiveness of US and Allied armed forces and enhance the security of the United States and the free world.

KEY MESSAGES

NPS is:

1. **EXCELLENT** NPS education and research programs are of the highest quality. Our faculty are recruited from, and sought after by, the best universities in our nation and abroad. Our students are accomplished professionals with tremendous career potential who take with them both academic as well as joint and combined military professional education credentials.

2. **RELEVANT** Accomplished NPS faculty, both civilian and military, integrate graduate education objectives of the Armed Services with relevant research at the applied and theoretical levels into degree programs and student theses and dissertations of great value to our nation and international partners.

3. **JOINT, COMBINED AND SERVING THE TOTAL FORCE** All branches of the U.S. Armed Services, and Armed Forces personnel from all over the world, come together with Department of Defense, Department of Homeland Security and civilians from other interagency departments and activities for a tactically and strategically joint and combined experience.

4. **MISSION CRITICAL** NPS develops our nation's foremost Department of Defense analysts, strategic thinkers and leaders — those who will lead the U.S. Armed Forces, our Allied and Combined Forces and our nation in the 21st Century.

5. **SERVING ORNATIONAL AND INTERNATIONAL SECURITY** NPS educational, research and outreach programs enhance our national and international security while building camaraderie and international relationships between students, faculty and institutions that will last lifetimes.

POINTS OF DIFFERENCE WITH CIVILIAN INSTITUTIONS OF HIGHER EDUCATION:

- Naval and defense focused curricula
- Wide-range of offerings in sciences, engineering, policy, security, management, and technology
- Ability to quickly develop and offer interdisciplinary programs if circumstances and changing world situations dictate
- All branches of the military and Coast Guard attend
- Focused on the total force integration and management including DoD Civilians
- Many international students from about 60 nations attend resident programs
- High-quality research at the theoretical and applied levels
- Alumni include key contributors in our nation's history
- Graduate degrees, military specific educational competencies and Joint Professional Military

Education are combined to meet Congressional direction
- Robust short course offerings for US and international student, in US and abroad, through a broad spectrum of web-based and distributed learning methods

DESCRIPTORS:

- Agile
- Adaptive
- Relevant
- Excellence
- Interagency
- Defense-Focused
- Innovative
- Responsive
- Internationally Focused
- Coalition

AUDIENCES

Internal

- Students
- Faculty
- Staff, including contractors
- FCA Outreach Offices
- Board of Advisors
- NPS Foundation

External

- Naval Leadership
  - ~ Navy Secretariat, CNO, CMC, VCNO, ACMC and OPNA V and HQMC Staffs
  - ~ Fleet and Fleet Marine Force leadership
  - ~ SYSCOMS/ONR
  - ~ Curriculum sponsors
  - ~ MPTE Enterprise
  - ~ KECNl\V Of:fii€l€l
- COCOMS
- DoD Leadership, Agencies and Activities
- Air Force Leadership, Agencies and Activities
- USMC Leadership, Agencies and Activities
- Army Leadership, Agencies and Activities
- AFIT and Air University BOV
- HLS Leadership
- Intelligence Community
- State Department and FSI
- Other federal agencies and interagency Activities (e.g. USAID)
- Higher Education/Other University Leaders
- Alumni
- Research and sponsored program sponsors
- Potential Students (military and civilian)
- Congress
- Monterey Community
- Fleet Concentration Areas
- Armed Forces Headquarters Regions
- Industry Leaders
- General Public
- NPS Foundation
- Foreign Ministries of Defence and their Armed Forces
- NATO and other Allied and strategic organizations such as the ASEAN Regional Forum

NPS STAKEHOLDER RESPONSIBILITIES

In order to achieve the NPS objectives, all elements of the NPS community must be involved in the following ways.

- Secretary of the Navy, CNO, Commandant, VCNO and ACMC, along with other Naval leadership, need to clearly understand and concisely communicate how they value higher education and NPS' contributions to higher education. Annual guidance to their forces should also reflect their commitments to educating their forces to achieve US Strategic Objectives in the 21st Century and beyond.
- NPS President and Provost must provide the vision and strategy for NPS. They set the priorities for NPS and are the key communicators within NPS and about NPS.
- NPS Chief of Staff, Deans, Department Chairs, Institute Directors, Executive Directors, Associate Provosts, and other key leaders must embrace the NPS strategy and vision and ensure that their organizational goals and plans are aligned accordingly. They must then communicate both within NPS and to their primary external customers and stakeholders about the NPS vision and how their initiatives support it.

- Faculty and staff need to understand and embrace the NPS vision and strategy and understand how it applies to them and how they are integral to the accomplishment of that vision.
- Students should understand the NPS vision and strategy and understand how they are integral to the accomplishment of that vision.
- Alumni should understand and embrace the NPS vision, strategy and long-term plans. They should understand how they are integral to the accomplishment of that vision and what they can do enhance NPS' successes.

METHODS OF COMMUNICATION

- Programs and Marketing Products
  - ~ Newsletters
  - ~ Web: Sites and Stories, Photo Gallery
  - ~ Brochures and Curricula Pamphlets
  - ~ Annual Catalog
  - ~ Staff and Faculty Visits
  - ~ Annual Report
  - ~ Media Visits
  - ~ Community Impact Study (Local)
  - ~ Press Releases
  - ~ Community Impact Study (Defense)
  - ~ Outreach Programs
  - ~ NPS Branding
  - ~ Student Briefings
  - ~ Give-Aways for Conferences and Outreach events
  - ~ Alumni Events and Judicious use of Distinguished Alumni
- Correspondence
  - ~ E-mail
  - ~ Written
  - ~ Verbal including marketing seminars
- Campus Visits
- Off-Campus Visits (DV Packets & Targeted Briefings)
- News stories by the media
  - ~ National
  - ~ Local
  - ~ Defense-related
  - ~ Navy-related
- All collateral materials will carry the authorized NPS branding and follow the NPS Style Guide specification.
- ''NPS Tag-Line" is under development and will be reflected on all marketing materials.

IMPLEMENTATION

- **Responsibility**: The President of NPS has overall responsibility for the formulation and implementation of this Strategic Communications Plan.
  - ~ The Associate Provost for Institutional Advancement is the President's lead agent under this responsibility and is accountable for developing an implementation plan, milestones, and the means to measure progress toward achieving objectives and goals.

- **Overview**: To advance the vision and capabilities that NPS brings to the Department of the Navy, Department of Defense, interagency and the nation, each contributor to implementation of this Strategic Communications Plan will understand its objectives and assist the Institutional Advancement Department with coordinating and orchestrating their individual and combined efforts to achieve NPS, DON and DoD objectives for the 21st Century. For example, our outreach to US Armed Forces can and will play a significant part in recognition of NPS as the premier institution of higher learning available for studies in the curricula for which we grant degrees. Research by faculty and students in areas of significant national and international interest can be highlighted by deans visiting Service Headquarters and international staffs, and when combined with briefings and demonstrations by students and faculty, who have completed that research, demonstrate the tremendous potential and critical acclaim of NPS' programs, faculty and graduates.

- When properly orchestrated, individual, School, Institute, CEE and combined efforts can ensure DOD-wide coverage for NPS on an annual (or semi-annual) basis as well as synchronize efforts to meet with and brief critical Inter-Agency and foreign partners. For example, if the MOVES Institute meets with key members of the OPNAV and Joint Staffs, they can carry the message of recent successes in modeling and simulation, and offer to have faculty and students brief those models and their potential. In another example, when deans and faculty are in Fleet Concentration Areas, they should coordinate with the OCL offices in those FCA's to influence regional commanders and generate interest in NPS programs and research.

- As the central focus of this Strategic Communications Plan, enthusiastic marketing of NPS and the potential of our faculty, students and graduates is everyone's responsibility.

TITLE

Issue Brief: Why Do We Need a Naval Postgraduate School (NPS)?

REF NO. N09BC • 1 May 1996

ABSTRACT

This brief answers why the Naval Postgraduate School is needed. Factors supporting its effectiveness and importance include NPS' primary mission — to prepare Naval officers with a DoD and DoN-specific graduate education not available at civilian universities — as well as the fact that NPS' program is cost-effective and offers an excellent research program.

EXCERPTS

"The primary goal of NPS is subspecialty education, not a master's degree. However, given the extent of the education required to meet educational skill requirements, it is practical, desirable and cost-effective for NPS students to obtain a master's degree while attending NPS."

"Officers are sent to NPS when the educational skills involve DoD-specific knowledge that is not readily available at civilian universities."

"N81-led study group in 1992 concluded that NPS was $22m cheaper than CIVINS would be for providing a fully comparable education. A 1993 analysis by NPS using N81 study data showed that NPS had a cost per class hour of $135 vice (versus) $176 for CIVINS."

"The NPS course of study is extremely rigorous. Students average 64 quarter credit hours of work per year compared with the normal 30 to 48 credit hours at average civilian universities for a longer period of time."

"NPS has an excellent research program. All students participate in research projects through required theses, often not a requirement for CIVINS master's degrees."

CD REF NO. PW–15

N09BC
1 MAY 96

Issue Brief
Why Do We Need A Naval Postgraduate School (NPS)?

PURPOSE

To respond to queries as to why NPS is needed.

DISCUSSION

The NPS primary mission is to prepare naval officers with education skill requirements needed to qualify them to serve in positions subspecialty requiring graduate education.

- Officers are sent to NPS when the educational skills involve DoD-specific knowledge that is not readily available at civilian universities.
- When educational skills may not require DoD-specific knowledge or relevancy, officers are sent to civilian universities (CIVINS).
- The primary goal of NPS is subspecialty education. not a master's degree. However. given the extent of the education required to meet educational skill requirements, it is both practical, desirable and cost-effective for NPS students to obtain a master's degree while attending NPS.

About half of NPS students change major fields between their undergraduate and graduate degrees. NPS is unique in its ability to accommodate these students, whereas civilian universities will not.

- NPS offers one or two quarter transition programs in which entering students can take courses needed to change academic majors.
- Accomplishing this at civilian universities requires either substantial accredited off-duty study prior to entering full-time graduate study, or a prohibitively long full-time graduate study status at higher costs to naval service.

NPS makes far more efficient use of officers' time.

- The NPS course of study is extremely rigorous. Students average 64 quarter credit hours of work per year compared with the normal 30 to 48 credit hours at average civilian universities for a longer period of time.
- NPS operates a full class schedule throughout the year. There is no limited summer session with limited course offerings. This provides admittance at the beginning of each quarter, and education of summer-time "dead-time" prevalent at most universities.
- NPS curricula are designed to ensure steady progression with required course in sequence. Civilian universities often do not offer required courses when needed which delay graduation and increases costs.

NPS is cost-effective in light of the extent of the education provided.

- N81-led study group in 1992 concluded that NPS was $22M cheaper than CIVINS would be for providing a fully comparable education.
- A 1993 analysis by NPS using N81 study data showed that NPS had a cost per class hour of $135 vice $176 for CIVINS.
- CIVINS may be cheaper if Navy sends students to shorter, generic master's degree programs. However, this would require overhauling and altering the subspecialty system to make the requirement simply a master's degree rather than specific educational skills requirements. If Navy is willing to settle for this lower standard, the CIVINS option would be $20M cheaper. But a significant change in the law would be required to eliminate the requirement for officer subspecialties.

Other considerations which, while not as critical to educational skill requirements, but nevertheless important are:

- One third of the student body consists of officers from other services and countries. We consider this interaction for a two-year program to be much more valuable that interface with the general civilian public at CIVINS.
- NPS has an excellent research program. All students participate in research projects through required theses, often not a requirement for CIVINS master's degrees. NPS is one of the few places still involved in small scale, small group basic research. R&D has become so highly structured with such a volume of justification materials and reviews that multi-million dollar projects which cannot be allowed to fail (even if they produce a poor, unnecessary or inadequate project) have become the "norm" in DoD and private industry. Other value-added benefits include NPS using "backyard garage" (hands-on experimental) technology, has produced scientific achievements, such as an acoustic refrigerator that has been successfully tested on the space shuttle and a circuit board for satellites that is a major advance over other systems for receiving and relaying short-wave signals. The Japanese, recognizing what is happening, have set up basic research institutes in the United States to use our scientists to do precisely this type of research. General Electric is using this technology to develop CFC-free, non-electric, acoustic generator type refrigerators and air conditioners which are scheduled to market approximately three years from now.

TITLE

Graduate Education in the Department of the Navy: Objectives, Cost-Effectiveness and Analysis of the Alternatives

SOURCE

NPS Document, Author Unknown, Date Unknown

ABSTRACT

Janice Graham's assertion that "subspecialty-based graduate education is outmoded and not valued by Navy leadership" and that such an education can be more cost-effective by the use of educational vouchers, privatizing or outsourcing NPS are disproved in this article. Contesting Graham's "flawed analysis," the article reviews the value of NPS' graduate education curricula in meeting the Department of the Navy's objectives, the program's cost-effectiveness, and asserts that the militarily-focused NPS program cannot be duplicated by civilian universities.

EXCERPTS

"Integrated Postsecondary Education Data System (IPEDS) cost data, reported by Cavalluzzo and Cymrot (1998), were modified to normalize for the effects of NPS' unique academic calendar and course scheduling, dual general education and subspecialty academic requirements, focus on graduate education and student salary and benefit considerations. After making these adjustments, the present value of civilian graduate educational costs per degree student range from $570,500 … to $208,400. The average for the 28 civilian universities considered is $268,300. NPS' graduate education costs are $207,200, lower than all civilian institutions considered. Student salaries and benefits account for anywhere between 25% and 70% of the totals, and average 53%."

"However, a dedicated Navy graduate institution offers several advantages, which help offset the cost subsidization, including operations tempo, admissions timing and admissions policies. Most importantly, NPS students receive more instruction per year than their civilian university counterparts. As explained above, NPS can deliver comparable material in a shorter period. This returns students to the fleet more quickly and reduces the associated student salary and benefit costs by up to 40%."

"Janice Graham … maintains that subspecialty-based graduate education is outmoded and not valued by Navy leadership. She suggests that DoN officers are better served by a general graduate education … Graham further suggests that it is more cost-effective to meet these educational objectives by either privatizing or outsourcing NPS or giving officers educational vouchers to attend the civilian institutions of their choice. This depiction redefines the objectives for Navy-funded graduate education, confuses the link between delivery modes and educational outcomes, and bases cost-effectiveness conclusions on cost analysis that doesn't standardize across alternatives and ignores the cost of student salaries and benefits. Graham's solutions redefine educational objectives on the basis of flawed analysis."

"Graham's article highlights the importance of clearly defining DoN's educational objectives, identifying the feasible delivery modes to meet those objec-

tives and comparing the cost-effectiveness of alternative means to provide a standardized degree program. Unfortunately, Graham's analysis fails to satisfy these requirements. In actuality, NPS meets its currently defined educational objectives and is cost-effective after standardizing for program content. This cost-effectiveness reflects NPS' more intensive student and faculty workloads, factors ignored in most existing cost analyses. Recent curriculum modifications also illustrate the value of retaining NPS' responsiveness and flexibility, an attribute civilian universities cannot even contemplate."

CD REF NO. PW–16

Graduate Education in the Department of the Navy: Objectives, Cost-Effectiveness and Analysis of the Alternatives

The Naval Postgraduate School (NPS) provides in-residence graduate education tailored, by law and directive, to meet the needs of Department of Navy (DoN) students (Navy and Marine Corps) as well as students from other services, civilian DoD employees and international officers. NPS' subspecialty based graduate curricula are developed in close coordination with Navy curricula sponsors to fulfill the technical and analytical educational skills required in specifically identified and coded billets. NPS' evolving curricula reflect guidance and instructions articulated in U.S. law, Secretary of the Navy instructions and Chief of Naval Operations' vision statements. As demonstrated elsewhere, NPS is also more cost-effective in providing this education that than an independently selected comparison group of 28 top ranked schools offering graduate engineering degrees.[1]

Janet Graham offers an alternative view in "Rethinking Graduate Education in the Navy and the Naval Postgraduate School." Driven largely by her interpretation of DoN's values and objectives for graduate education and her (mis)perception of relative education costs at NPS, Graham recommends education vouchers (redeemable at the student's school of choice), privatization and outsourcing as alternatives to NPS graduate education.[2] This recommendation reflects Graham's view that the Navy places the least value on graduate education of any service, and that Naval officers are best served by general educational objectives that emphasize" … the process and practice of innovation and the skills of an entrepreneur." Graham's proposal represents a radical departure from current educational objectives. Therefore, its underlying assumptions and recommendations deserve close scrutiny.

DON'S VALUE OF GRADUATE EDUCATION

Graham asserts that DoN does not value graduate education using primarily anecdotal evidence.[3] In contrast to Graham's assertion, this discussion assumes that DoN values graduate education. The Navy faces rapid changes in technology, social interactions and military strategy in the 21st century. Presumably, Navy leaders recognize that education is a key to preserving maritime dominance in this environment. If graduate education becomes a hurdle to jump for promotion, DoN should stop funding in-residence graduate education and find the cheapest means possible to jump this hurdle. If current or future Navy culture views graduate education as critical, then DON must define the appropriate educational objectives and identify the most cost-effective means to achieve those objectives.

DON'S VISION FOR NPS GRADUATE EDUCATION

In contrast to Graham's description, the mission

[1] Gates, et al., "*A Bottom-Up Assessment of Navy Flagship Schools*: The NPS Faculty Critique ofCNA's Report," NPS-FC-98-001, Naval Postgraduate School, November, 1998.

[2] Graham states that "Initial forays to several top-tier private universities for the purpose of determining their interest in some type of partnership with NPS were most promising … " However, Graham does not provide any reference for this assertion, list the universities individuals contacted, or describe the ground rules specified for this partnership (e.g., student/faculty workloads; admissions timing, policies and requirements; curriculum content and review; etc.). As such, it is difficult to determine the actual interest level.

[3] This point is also promoted in Linda C. Cavalluzzo and Donald J. Cymrot, "A Bottoms-Up Assessment of Navy Flagship Schools," CRM 97-24, Center for Naval Analyses, January 1998.

and objectives of a Navy-funded graduate school are well defined, including the role NPS plays relative to other Navy-funded graduate education. NPS' objectives are described in three sources: Title 10 U.S.C., Section 7041-7047 and SECNAV Instruction 1524.2A (April 4, 1989), the Chief of Naval Operations (CNO) "Vision Statement for Graduate Education" (May 5, 1999), and the Naval Postgraduate School vision statement (www.nps.navy.mil).

Title 10 U.S.C. established NPS and SECNA V Instruction 1524.2A defined NPS' academic purpose. Instruction 1524.2A describes NPS' mission and objectives as follows:

> **Background** To perform effectively in peace and war, Navy and Marine Corps officers must understand the technologies inherent to the capabilities of their weapons systems and ships … The professional development and education of Navy and Marine Corp officers must, therefore, give them … the knowledge to operate in an increasingly sophisticated technological environment …
>
> **Rationale For NPS** The NPS exists for the sole purpose of increasing the combat-effectiveness of the Navy and Marine Corps. It accomplishes this by providing post-baccalaureate degree and non-degree programs in a variety of subspecialty areas not available through other educational institutions.
>
> **General Program Guidance** NPS programs must provide officers the latest technological knowledge relevant to their future duty assignments as well as an appreciation of the fundamentals of maritime strategy and concepts of naval warfare.

The CNO's "Vision Statement for Navy Officer Education" reaffirms this focus by stating:

> … flexibility and creativity are more important than ever as today's fast pace and rapid increase in technological sophistication defme our times.

This guidance is embodied in NPS' vision statement:

> Increase the combat-effectiveness of U.S. and Allied armed forces and enhance the security of the U.S. through advanced education and research programs focused on the technical, analytical, and managerial tools needed to confront defense-related challenges.

Reflecting these instructions and vision statements, NPS subspecialty-based graduate curricula provide students with the technical and analytical skills required in certain specifically identified and coded billets. However, this is only one of the unique attributes NPS provides. Other critical characteristics that distinguish NPS from civilian universities include:

- Military relevant curricula offerings that meet Navy subspecialty and general education requirements and projected billet requirements (the Navy has rejected the idea that a set of degree programs serendipitously chosen by its officer corps would meet Navy needs)
- Programs subject to biennial Navy flag-level curriculum sponsor review for military relevancy with the capability to swiftly implement desired course and program changes
- Entrance controlled by military performance instead of undergraduate grade-point average and standardized testing (e.g., GRE scores)
- Opportunity for high-ability, high-motivation officers to transition from one undergraduate area to a different graduate major (unlike industry, the Navy cannot hire mid-career talent with the desired skill sets; it must educate them from within the ranks; e.g., Astronaut Winston Scott transitioned from an undergraduate music major to aeronautical engineering)
- Opportunity for refresher courses to allow students to renew academic skills after several years of on-the-job performance
- Faculty and students participating in over 500 reimbursably funded research projects per year on issues of interest to sponsoring (funding) agencies from the DoN and throughout the U.S. government[4]
- A student body combining junior officers from the Navy, Marines, Army, Air Force, National Guard, civilian defense agencies and scores of foreign countries to explore technical, operational and strategic problems.

This partnership among students, faculty and sponsors (curriculum and research) produces an unparalleled mix of attributes that are not available in civilian graduate programs. If DoN wants to replicate these attributes in civilian universities, it will have to establish Navy unique programs under civilian control (i.e., outsource or privatize NPS). Navy leadership di-

[4] This reflects the NPS FYOO reimbursable research program as of 1 June 2000.

[5] Graham observes that" … there does not seem to be a part of any curricula that could not be taught by a civilian university-if one was asked to structure and teach such a course for military students." While this is true, civilian universities are unlikely to provide military unique course material, or the other attributes NPS currently offers, if DoN students simply pay civilian tuition rates.

rectly controls these attributes at NPS; they would be contractually specified in civilian universities.[5]

NPS' subspecialty curricula include both technical and non-technical fields. While many of these fields appear to have civilian counterparts, NPS curricula are uniquely tailored to Navy-specific requirements. Each degree program satisfies civilian-sector degree requirements (as necessary to maintain accreditation) and DoN subspecialty requirements. For example, both NPS and civilian universities offer programs in Contract Management and Manpower Systems Analysis. However, the NPS curricula include both the general material covered in civilian universities and DoN and DoD-specific issues. For instance, Contract Management includes DoN and DoD specific contracting policies, requirements and case studies; Manpower Systems Analysis addresses the software, databases and analytical techniques peculiar to military manpower analysis. Similar examples characterize every technical and non-technical degree program that NPS offers.

Most importantly, NPS curricula are responsive to DoN and curriculum sponsor direction in ways likely invisible to Graham. NPS cut the number of different curricula in electronic/information warfare at the behest of VADM Arthur Cebrowski when he was N-6. NPS also offers a relatively new 18-month curriculum for Special Warfare Officers. It is an inter-service, interdisciplinary curriculum, sponsored by USSOCCOM. It was initiated under close scrutiny from USCINCSOC himself, and is very popular with student sponsors. A similar program is under development for Navy combat officers and international students. Students also have increasing opportunities to complete Professional Military education Phase One during their standard NPS tour, from on-site Naval War College instructors. Finally, NPS is working with Navy sponsors and operational forces to provide distance learning, including both traditional NPS degree courses and graduate-level short courses.[6]

Graham's model for Navy graduate education emphasizes general educational skills, including institutional cultural innovation ("better business practices" and the basics of acquisition), the art of diplomacy and debate, computer literacy, culture and languages.[7] This model represents a deviation from SECNAV Instruction 1524.2A. Distinguishing between these two educational models raises two questions: which is the appropriate objective for Navy-funded graduate education and what is the most cost-effective way to provide that education? The first question should be answered by comparing the costs and benefits of the alternative educational objectives; the second question should be answered by comparing the cost-effectiveness of alternative delivery modes. The answers to these questions are interrelated. The delivery mode depends on the educational objectives.

COMPARING THE COSTS AND BENEFITS OF SUB-SPECIALTY DRIVEN VERSUS GENERAL GRADUATE EDUCATION

NPS, like Graham, believes that benefits of subspecialty-based curricula are not measured by utilization rates in appropriately coded billets. Education benefits are recouped throughout the service member's career. Furthermore, P-code designated billets are primarily shore-duty billets. However, operational tours benefit from subspecialty-based education. Ships benefit from officers educated in electronics, combat systems, information technology, financial management, etc.; airwings or squadrons benefit from officers educated in aeronautics and astronautics, mechanical engineering, etc. Thus, P-code utilization rates only capture a portion of the relevant jobs that officers fill.

If utilization rates in appropriately coded pay-back billets do not measure the benefits of subspecialty based graduate education, how can we measure these benefits? These benefits are reflected by the added value subspecialty trained students bring to their future DoN assignments, compared to their more generally educated colleagues. In some cases, added value is reflected in lower on-the-job-training requirements, better familiarity with required DoN/DoD policies and procedures, or knowledge about unique military software or databases. In other cases, added value may be reflected in specialized technical knowledge essential for DoN or DoD but not available through civilian-sector universities. Examples include underwater acoustics and information warfare, as well as military specific topics in meteorology, oceanography, aeronautical engineering, mechanical engineering, etc.

Cost-benefit analysis of subspecialty-based curricula should measure the costs and benefits of increasing-

[6] This is consistent with SECNAV Instruction l2524.2A, which states: "The objectives of graduate education at the NPS are to prepare officers to fill subspecialty positions … Graduate degree and non-degree (short courses) programs in technical and nontechnical fields shall be established by the Superintendent of the NPS in response to Navy and Marine Corps requirements."

[7] See also Cavalluzzo and Cymrot (1998) pp. 5-6,63,72-73.

ly specialized curricula. DoN may fmd that certain subject areas or communities (e.g., Restricted Line versus Unrestricted Line) are better served by subspecialty education, while others are better served by general education. Considering DoN's size and diversity, one set of educational objectives is unlikely to satisfy all service members in all communities for both shore and sea assignments. Graham concludes that NPS' specialized curricula unacceptably increase NPS' education costs. However, she never analyzed either the costs or benefits of subspecialty based curricula.[8] Such an analysis would be an appropriate starting point.

COST EFFECTIVENESS IN DoN FUNDED GRADUATE EDUCATION

In her cost analysis, Graham compares NPS' average annual cost per student to tuition costs at civilian institutions. However, this cost comparison is largely irrelevant. Cost-effectiveness analysis must first consider educational objectives. If DoN validates subspecialty-based curricula, the relevant alternatives include NPS, outsourcing and privatization. If DoN adopts a general education model, the relevant alternatives include a restructured NPS and tuition payment to civilian institutions.[9]

Sub-Specialty Based Graduate Education: NPS, Outsourcing and Privatization

To consider outsourcing or privatization, private sector producers must improve performance or reduce costs, resulting in better value to the government. OMB Circular A-76 provides detailed instructions concerning cost comparisons between government and commercial producers. These instructions emphasize the need to normalize for differences in outputs when comparing costs (Executive Office of the President, Office ofManagement and Budget (OMB), Circular A-76).

In comparing NPS' costs to the price civilian universities would charge for outsourcing or privatizing subspecialty-based graduate education, tuition rates are largely irrelevant. Endowments and state/local tax financing subsidize civilian tuition. Civilian universities would likely view an outsourcing or privatization proposal as a business opportunity that they would enter if profitable. It is unreasonable to believe that civilian universities have excess endowment funds or tax financing to subsidize DoN graduate education.[10] Thus, the appropriate comparison involves total education costs at both NPS and civilian universities, *given a standardized educational offering.*

Unfortunately, there are critical differences between NPS and civilian universities. NPS' unique benefits have been described in detail elsewhere (Gates, et al., 1998). These benefits include:

- Military relevant graduate education that satisfies dual general education and subspecialty requirements
- Institution devoted to graduate education (instruction by regular faculty; no teaching assistants)
- Atypical calendar and scheduling with heavier than normal class loads and full throttle operations 48 weeks per year
- Quarterly admissions with demand driven course scheduling (courses scheduled to guarantee on-time graduation as opposed to minimum class size requirements)
- Admissions policy emphasizing military potential rather than academic achievement
- Refresher and transitional courses to transform mid-career adult learners to new academic fields, as required by the military's policy against mid-career accessions in needed skill areas
- Thesis required in all degree programs, which increases relative intensity of faculty use
- Military infrastructure superimposed on top of traditional academic infrastructure to maintain professional and military aspects of officer-student careers
- Infrastructure to support classified courses, laboratories and student/faculty research

All of these unique attributes increase NPS' average annual education costs per student relative to the standard civilian-sector model. Furthermore, educational costs are only a portion of DoN's total grad-

[8] Graham reports average annual cost per NPS student, not the cost impact of increasing sub-specialization. The same criticism applies to Cavalluzzo and Cymrot (1998).

[9] Of course, these alternatives are not equivalent substitutes. Restructuring NPS into fewer, broader curricula would increase the emphasis on general education while retaining some focus on DoN and DoD-specific issues. Sending students to existing civilian programs would lose all focus on DoN and DoD issues unless civilian programs were augmented by Navy-funded supplementary material. This would require funding beyond tuition expenses.

[10] Graham suggests that civilian universities might be anxious to share their endowments with DoN. She states, "High quality educational institutions normally have large endowments that could be of great benefit in maintaining and improving the physical and educational infrastructure at NPS." This is only possible if civilian universities enter outsourcing or privatization agreements out of a sense of public service, not as business opportunities.

uate education costs; DoN pays the students' full salary and benefits while they attend in-residence graduate programs. These costs can be significant relative to educational costs. Salary and benefits are important to consider if graduate programs differ in duration. As discussed below, this represents an important difference between NPS and civilian universities. The most critical adjustments include:[11]

Academic Calendar and Course Scheduling The Navy wants every day of graduate education to count because an officer's time away from the fleet is precious. Thus, the typical NPS student receives 16 hours of instruction per week and attends class 48 weeks per year. This totals 768 hours of instruction per year. In contrast, civilian-sector graduate students typically receive approximately 486 hours of instruction per year if they attend summer classes (when course offerings are typically limited).[12]

Dual General Academic and Sub-Specialty Educational Requirements This analysis uses class hours as a proxy for course content. While class hours are an input to the education process, they can be used as a proxy for education as long as NPS and civilian faculty and students deliver and absorb material at the same rate. The average NPS graduate degree program requires 18 months and involves 1152 hours of class instruction;[13] civilian universities would require 28 months to deliver an equivalent course content.[14]

Focus on Graduate Education Graduate education is more expensive than undergraduate education. Larger undergraduate class size and instruction by graduate teaching assistants are at least two reasons to expect this cost difference. Graduate instruction and research also require more expensive equipment and specialized laboratories, especially if students are required to complete a Master's thesis. This is particularly significant for technical graduate programs. One analysis found that graduate education in Washington, Florida and Illinois was two to three times as expensive as undergraduate education.[15] This analysis adjusts civilian university costs, assuming that graduate programs are twice as expensive as undergraduate programs.

Student Salaries and Benefits If NPS and civilian programs are of different duration (e.g., 18 versus 28 months as indicated above), any cost comparison must include the students' salaries and benefits. This is a significant portion of the total cost of graduate education for DoN officers. The DoN Director, Assessment Division (N81) estimated that the annual cost of salary, benefits, and housing (referred to as MPN costs) per NPS-resident officer equaled $63,300, compared to $72,300 per officer-student at civilian institutions.[16] The higher civilian MPN cost reflects that NPS officers predominantly live in base housing.

Integrated Postsecondary Education Data System (IPEDS) cost data, reported by Cavalluzzo and Cymrot (1998), were modified to normalize for the effects of NPS' unique academic calendar and course scheduling, dual general education and subspecialty academic requirements, focus on graduate education and student salary and benefit considerations. After making these adjustments, the present value of civilian graduate educational costs per degree student range from $570,500 (California Institute of Technology) to $208,400 (University of Texas at Austin). The average for the 28 civilian universities considered is $268,300. NPS' graduate education costs are $207,200, lower than all civilian institutions considered. Student salaries and benefits account for anywhere between 25% and 70% of the totals, and average 53%.

These results indicate that NPS is cost competitive with civilian universities after normalizing for NPS'

[11] For a more complete discussion see Gates, et al. (1998), pp. 11-22.

[12] NPS' heavier class load makes sense because the Navy pays these students full salary and benefits. They do not need outside jobs to feed their families.

[13] Cavalluzzo and Cymrot, 1998. Alternatively, NPS and civilian university costs could be scaled to a 972 class hour civilian graduate program. Relative NPS and civilian costs are the same in either case; only the scale differs.

[14] Graham incorrectly asserts that NPS' dual educational requirements increase degree program length at NPS relative to civilian universities. In actuality, NPS' more intensive academic calendar allows NPS to satisfy dual education requirements without extending the graduate program length. Transitional and refresher courses have a greater impact on program length. These classes reflect Navy policy allowing students to enter NPS in fields outside their undergraduate major. This flexibility is essential considering the Navy's closed-pipe personnel system that precludes mid-career accessions in areas of Navy need.

[15] Peter D. Syverson and Moira J. Maguire, "Estimating Institutional Costs of Graduate Education: Reports from Three States Demonstrate Promise, Pitfalls of Cost Studies," Council of Graduate Schools, 1997.

[16] "Memorandum for the Deputy Chief of Naval Operations (Resources, Warfare Requirements and Assessments)," Ser N8 I/3U639949, 29 March 1993).

unique academic calendar and course scheduling, dual general education and subspecialty academic requirements, focus on graduate education, and student salary and benefit considerations. If the Navy retains its subspecialty-based degree program, it is unlikely to reduce the total costs of in-residence graduate education by outsourcing or privatization. NPS would look even more favorable in the cost comparison after adjusting for other cost-related unique attributes.[17]

This result is counter to the prior implications comparing average annual costs per student. The primary explanation for this seeming contradiction involves NPS student workloads relative to typical civilian graduate programs. As explained above, student workloads are higher at NPS than at civilian graduate programs, both in terms of hours per week and weeks per year. Higher student workloads use faculty more intensively. This increases the average annual cost per student, but reduces the program's length *for a standardized degree program*. Comparing graduate education costs for a standardized graduate program (e.g., 1152 course hours) normalizes across program content. Incorporating student salary and benefits captures the most significant impact of higher student workloads; students return to the fleet more quickly. This reduces DoN's total degree program costs. Average annual costs per student don't capture the benefits of shorter program duration; they only capture the adverse cost implications of using faculty more intensively.

General Graduate Education: Restructuring NPS and Paying Tuition at Civilian Institutions

Graham compares NPS' current costs to tuition costs at civilian institutions.[18] However, this comparison is meaningless, even if DoN adopts a general education objective. NPS' current costs reflect subspecialty-based graduate education. For comparability with civilian institutions, DoN would first have to redefme a general NPS curriculum structure. This is beyond this paper's scope, but we will offer some observations.

On the surface, cost-effectiveness at NPS is unlikely to compare favorably with tuition costs at civilian institutions. Tuition only covers a portion of educational costs at civilian universities.[19] Endowments and tax financing fund the balance. The Navy must pay all educational costs at NPS. Thus, civilian universities have a seemingly overwhelming inherent cost-effectiveness advantage.

However, a dedicated Navy graduate institution offers several advantages, which help offset the cost subsidization, including operations tempo, admissions timing and admissions policies. Most importantly, NPS students receive more instruction per year than their civilian university counterparts. As explained above, NPS can deliver comparable material in a shorter period. This returns students to the fleet more quickly and reduces the associated student salary and benefit costs by up to 40%. The benefits of a higher operations tempo can swamp education cost differences. Furthermore, NPS admits students quarterly. This minimizes the time students may be stashed while waiting to begin school and decreases the number of students precluded from attending in-residence graduate programs because of timing.

Finally, NPS admits students based on military relevant admissions requirements; civilian universities consider undergraduate academic records, scores on the Graduate Record Exam (GRE) and, in some cases, relevant professional experience. Furthermore, civilian admissions committees balance demographic characteristics of their incoming classes, and the prestigious programs often suggested as alternatives to NPS are not currently under-subscribed by civilian students. Thus, civilian programs would likely limit admissions to one or two of the most qualified Navy students. This creates problems if the Navy seeks quality civilian education for large numbers of service members. Of course, marginal schools that struggle to maintain enrollment would welcome large groups of Navy students willing to pay full tuition, but Navy leadership should carefully consider the resulting tradeoff between cost and educational quality.

CONCLUSIONS

Janet Graham provides one perspective on Navy-funded graduate education. She maintains that subspecialty-based graduate education is outmoded and not valued by Navy leadership. She suggests that DoN officers are better served by a general graduate education that emphasizes entrepreneurial skills,

[17] For example, quarterly inputs and class scheduling to ensure on-time graduation reduce class size; maintaining a military infrastructure increases administrative costs and the thesis requirement increases faculty costs.

[18] Cavalluzzo and Cymrot (1999) also made this comparison.

[19] Tuition covers between 13% and 73% of educational expenditures in the civilian university sample described above. Cavalluzzo and Cymrot (1998), p. 69.

public speaking, debate and better business practices. Graham further suggests that it is more cost-effective to meet these educational objectives by either privatizing or outsourcing NPS or giving officers educational vouchers to attend the civilian institutions of their choice. This depiction redefines the objectives for Navy-funded graduate education, confuses the link between delivery modes and educational outcomes, and bases cost-effectiveness conclusions on cost analysis that doesn't standardize across alternatives and ignores the cost of student salaries and benefits. Graham's solutions redefine educational objectives on the basis of flawed analysis.

DoN's objectives for NPS graduate education are well articulated in U.S. law, SECNAV Instruction, and the CNO's and NPS' vision statements: provide technical, analytical graduate education in a variety of subspecialty areas not available in civilian universities. NPS provides this education using DoN relevant operations tempo, admissions criteria, course scheduling and course content. As appropriate, NPS quickly adapts curricula to the sponsor's changing preferences. NPS' curricula are well-received and highly valued by their Navy curriculum sponsors. While many civilian institutions offer graduate education, none provide graduate education with the Navy-unique characteristics that NPS offers.

Graham's article highlights the importance of clearly defming DoN's educational objectives, identifying the feasible delivery modes to meet those objectives and comparing the cost-effectiveness of alternative means to provide a standardized degree program. Unfortunately, Graham's analysis fails to satisfy these requirements. In actuality, NPS meets its currently defined educational objectives and is cost-effective after standardizing for program content. This cost-effectiveness reflects NPS' more intensive student and faculty workloads, factors ignored in most existing cost analyses. Recent curriculum modifications also illustrate the value of retaining NPS' responsiveness and flexibility, an attribute civilian universities cannot even contemplate.

As technology becomes increasingly important to maintaining military superiority, it is increasingly important for officers to receive tailored technical graduate education such as that provided by NPS. It is inappropriate to redefine DoN's graduate education objectives based on Graham's flawed analysis. Considering DoN's and DoD's increasing technological sophistication, more students should benefit from military-focused technical graduate education, not fewer. Graham's analysis does not objectively and rigorously demonstrate that DoN should close, privatize or outsource NPS.

TITLE Commercialization in the Department of the Navy — Panacea or Hyperbole

AUTHORS William R. Gates and John E. Mutty

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Commercialization in the Department of the Navy — Panacea or Hyperbole

The Case Against Commercializing the Naval Postgraduate School

WILLIAM R. GATES AND JOHN E. MUTTY

Resources have become increasingly constrained within the Department of Defense (DoD) and the Department of the Navy (DoN), but worldwide national security commitments and operating tempo have not decreased accordingly. Under the inevitable budgetary pressure, it is natural to search for ways to reduce defense costs and improve efficiency. As in the private sector, DoD and DoN have recently re-emphasized outsourcing and privatization to both reduce costs and focus attention on core business functions. Competition for government business encourages effective operations and cost efficiencies, whether the function is contracted out to a commercial provider or retained in-house. This article illustrates some of the factors that should be considered when identifying potential candidates for commercialization. We will discuss DoD's and DoN's commercial activities initiative, using suggestions to outsource or privatize the Naval Postgraduate School (NPS) as an illustration. In particular, we will describe the commercialization process and identify the types of activities most likely to generate significant cost savings. Drawing on this background, we will provide a preliminary NPS commercialization study and cost analysis.

NPS primarily provides in-residence graduate education for Department of Navy students (Navy and Marine Corps) as well as for students from other services, civilian government employees and international officers from over 60 foreign countries. Suggestions for improving efficiency in DoN- funded graduate education include privatizing or outsourcing NPS, providing education vouchers redeemable at the student's choice of school, and sending students to existing programs in civilian universities.

This article concludes that DoN is not likely to capture any cost savings by outsourcing or privatizing NPS' graduate education mission.[1] The characteristics of graduate education, as currently defined at NPS, are not conducive to outsourcing or privatization, and cost comparisons indicate that NPS is cost competitive with its private sector counterparts. The analysis also indicates that NPS is cost competitive with tuition costs at civilian universities, after considering all relevant costs of in-residence graduate education. Because cost growth in higher education has far outstripped the Consumer Price Index for the last two decades,[2] it is logical to assume that NPS' current cost competitiveness will become even more favorable in the future. As with any government activity, budgetary constraints at NPS such as Congressionally imposed caps on pay raises, restrict the growth of expenditures. To remain competitive, the private sector often is required to offer salaries and benefit increases that exceed government levels. The effect can make privatization and outsourcing decisions much less attractive for the long-term.

THE CASE FOR CONTRACTING OUT COMMERCIAL ACTIVITIES[3]

Commercialization has the potential to reduce government costs and improve efficiency by exploit-

[1] This conclusion is consistent with the results of an independent study by Booze, Allen and Hamilton: "NPS Outsourcing In-Place," unpublished presentation, March 2000.

[2] Digest of Educational Statistics, 1999, Table 38; National Center for Educational Statistics, September 1999

ing private-sector advantages. These advantages include labor market efficiencies and scale economies.[4] Compared to the public sector, private sector managers have greater flexibility in designing labor policies, including compensation and incentives, accountability and capital-labor tradeoffs. Private sector firms can also capture scale economies unavailable to public sector producers when a large supplier provides a service to multiple customers. Labor market efficiencies and scale economies give private sector providers an inherent advantage in activities where these factors are significant cost drivers.

While labor efficiencies and scale economies explain private sector advantages, competition is considered the key for the government to capture these benefits. Competition forces both public and private sector providers to identify sources of efficiency and share the benefits with the government. In fact, experience indicates that government costs decrease after conducting a competitive commercialization study, whether the activity is contracted out or retained in-house. Estimates vary, but several studies report costs reductions of up to 35% for private-sector "wins" and 20% for in-house "wins." The private sector wins 55-60% of the competitions; in-house government providers win the remainder.[5]

Unfortunately, these promising potential results have at least two counter arguments: commercialization studies involve significant costs and there is debate concerning the validity of DoD's cost savings estimates. First and foremost, the commercialization process, described in greater detail below, can be costly and lengthy (one to two years or more). During and after this process, morale can suffer among employees facing impending job risks; low morale can also spread from at-risk employees to their coworkers. Finally, efficiency may suffer if managers take short run actions that might help ease potential future transition problems (e.g., billet stockpiling).[6]

In addition, The U.S. General Accounting Office (GAO) concludes that DoD's cost savings estimates are based on cost studies, not actual savings comparing pre- and post-competition operating costs. These estimates use cost models rather than the detailed estimates prepared by the installations considering commercialization. Furthermore, DoD's cost estimates do not include the inevitable contract modifications or cost increases occurring after implementing the commercialization plan. Finally, GAO cautions that DoD's estimates may not reflect all the costs associated with the commercialization process, including the costs of completing the commercialization studies themselves. Others suggest that DoD may underestimate the labor-related costs of switching from in-house to private sector producers. As such, there is reason to question the accuracy of DoD's savings estimates.[7]

Thus, commercialization studies can generate significant benefits, but they are costly and disruptive. As a result, commercialization studies should be directed at activities with the greatest potential for significant net savings. This includes activities where labor efficiencies and scale economies offer the greatest potential to reduce costs. Equally as important, these activities should be provided by a competitive private sector market to ensure that cost reductions translate into government cost savings. Finally, there should be evidence that in-house government costs exceed private sector costs for similar products or services. As the President's Commission on Privatization observes:

> Contracting is likely to be most successful where the terms and measurements of service delivery are clear and easily defined, where at least several firms have the capacity to perform the contract, where the contractor does not have to make large new capital expenditures, and where the contract can be subject to renewal and renegotiation regularly.[8]

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[3] In this discussion, commercialization includes both outsourcing and privatization. The primary distinction between outsourcing and privatization involves ownership of the relevant capital assets. With outsourcing, the government shifts responsibility for a commercial activity from in-house to private-sector providers, but retains ownership over the associated capital assets. With privatization, the government also divests itself of the capital assets. (See *Defense Acquisition Deskbook, Version 3.2,* Department of Defense, Joint Program Office, January 2000.) This distinction, important in practice, is largely irrelevant to this discussion.

[4] Robbert, Albert A., Susan M. Gates and Marc N. Elliot, "Outsourcing of DoD Commercial Activities: Impacts on Civil Service Employees," Santa Monica, CA: RAND, 1997, pp. 11-12.

[5] Office of Management and Budget, "Enhancing Governmental Productivity Through Competition" August 1988 and March 1984; Marcus, Alan, "Analysis of the Navy's Commercial Activities Program," Research Memorandum 92-226, Alexandria, VA: Center for Naval Analysis, July 1993.

[6] U.S. General Accounting Office (GAO), "OMB Circular A-76: DoD's Reported Savings Figures Are Incomplete and Inaccurate," GAO/GGD-90-58, March 1990; Robbert, et al., 1997; Tighe, Carla E., et al., "Case Studies in DoD Outsourcing," CAB 96-62, Alexandria, VA: Center for Naval Analyses, January 1997,

[7] GAO, 1990; Robbert, et al., 1997.

[8] Linowes, David F., Chairman, *Privatization: Toward More effective government*, Report of the President's Commission on Privatization, March 1988.

COMMERCIALIZATION GUIDELINES

General guidance for government commercialization studies is codified in U.S. law (Title 10 U.S.C., sections 2461-2471). OMB Circular A-76 provides detailed instructions for comparing in-house government and commercial producers (Executive Office of the President, Office of Management and Budget (OMB), Circular A-76, Revised Supplemental Handbook, March 1996). Dating back to 1955, OMB A-76 is designed to: "(I) balance the interests of the parties to a make or buy decision, (2) provide a level playing field between public and private offerors to a competition, and (3) encourage competition and choice in the management and performance of commercial activities." (OMB Circular A-76, p. iii)[8]

The specific steps in the OMB A-76 commercialization study process include:

- Develop a performance work statement (PWS) that clearly defines the product or service required without specifying the way in which the product or service is produced
- Develop an in-house government most efficient organization (MEO) to satisfy the PWS
- Estimate the in-house government cost to satisfy the PWS using the MEO
- Solicit cost estimates to satisfy the PWS from potential private sector contractors
- Estimate the costs of contract performance, including the contract price, contract administration costs, adjustments for federal income tax benefits of the contract and one-time conversion costs (e.g., labor transition assistance costs and severance pay)
- Contract with the private sector contractor if the total costs of contract performance, including all one-time costs, are more than 10-percent less than the in-house cost[10]

Following this guidance, we must begin assessing the prospects for commercializing NPS by identifying the mission and objectives (PWS) of a Navy-funded graduate school, and the particular role played by NPS relative to other Navy-funded graduate education. After establishing the PWS, we will then conduct a preliminary cost analysis that compares in-house NPS and private sector university costs to satisfy NPS' PWS. In this analysis, we will assume that NPS has already adopted its MEO. Similarly, we will assume that competition has forced private sector universities to evolve to their MEO. This preliminary analysis will not consider contract administration costs, tax implications or one-time conversion costs.

PERFORMANCE WORK STATEMENT

There are at least two competing notions of the appropriate NPS graduate education model and PWS. The PWS could either emphasize subspecialty-based technical curricula or general graduate education, with some technical content.[11] NPS currently provides subspecialty-based curricula; some authors have proposed a more general graduate curriculum.[12]

NPS currently offers curricula satisfying 45 subspecialty requirements. The sub-specialties include both technical and non-technical fields. While many of these fields appear to have civilian counterparts, NPS curricula are uniquely tailored to Navy-specific requirements. Each degree program satisfies general civilian degree requirements and DoN subspecialty requirements. The general education component ensures that NPS remains accredited by the appropriate civilian accreditation committees. Subspecialty courses ensure that graduates are fully qualified for the relevant DoN and DoD subspecialty jobs. Biennial curriculum reviews by Navy flag-level curriculum sponsors ensure NPS programs remain responsive to DoN and DoD requirements.[13]

For example, both NPS and civilian universities offer programs in Contract Management and Manpower Systems Analysis. However, the NPS curricula include both the general material covered in civilian universities and DoN and DoD-specific is-

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[9] See also OMB, 1988 and OMB, 1984.

[10] OMB A-76; see also Robber!, et al., 1997, pp. 15-17.

[11] Admiral Henry H. Mauz, Jr. (Retired) and William R. Gates, "The Naval Postgraduate School: It's About Value," *Naval Institute Proceedings*, August 2000.

[12] Linda C. Cavalluzzo and Donald J. Cymrot, "A Bottoms-Up Assessment ofNavy Flagship Schools," CRM 97-24, Center for Naval Analyses, January 1998; Janice M. Graham, "Rethinking Graduate Education in the Navy and the Naval Postgraduate School," *Naval Institute Proceedings*, July 2000.

[13] In response to evolving Navy needs, NPS has recently initiated new graduate programs in Information, Systems and Operations; Systems Engineering and Integration; an interservice, interdisciplinary curriculum for special warfare officers; and a cooperative program with MIT focusing on product development. Students are also increasingly completing phase one of professional military education during their standard NPS tour through on-site classes from Naval War College instructors. Finally, NPS is working to increase its distance learning offerings.

sues. Contract Management includes DoN and DoD specific contracting policies, requirements and case studies; Manpower Systems Analysis addresses the software, databases and analytical techniques peculiar to military manpower analysis. Similar examples characterize every technical and non-technical degree program that NPS offers. This DoN and DoD-specific material allows graduates to integrate more quickly into follow-on job assignments.

An alternative model for Navy graduate education emphasizes general educational skills. Proponents of this model emphasize that general graduate education prepares students to address a range of issues and problems in various career stages.[14] One suggestion would consolidate curricula into five general fields that provide some specialty area knowledge, but also emphasize institutional cultural innovation ("better business practices" and the basics of acquisition), the art of diplomacy and debate, computer literacy, culture and languages. More extreme suggestions would pay tuition to send NPS students to civilian universities or provide students with education vouchers to attend the school of their choice.[15] The PWS depends critically on the educational objectives specified for NPS.

In actuality, NPS' subspecialty based educational objectives are specified in U.S. law (Title 10 U.S.C., Section 7041-7047) and Secretary ofthe Navy Instruction (SECNAV Instruction 1524.2A, April 4, 1989). Specifically, Title 10 U.S.C. establishes NPS and the SECNAV Instruction defines NPS' academic purpose. SECNAV Instruction 1524.2A describes NPS' mission and objectives as follows:

> **Rationale for NPS** The NPS exists for the sole purpose of increasing the combat-effectiveness of the Navy and Marine Corps. It accomplishes this by providing post-baccalaureate degree and non-degree programs in a variety of subspecialty areas not available through other educational institutions.
>
> **General Program Guidance** The NPS shall strive to benefit the Naval Services through the education of Navy and Marine Corps officers. NPS programs must provide officers the latest technological knowledge relevant to their future duty assignments as well as an appreciation of the fundamentals of maritime strategy and concepts of naval warfare.
>
> **Academic Curricula** The objectives of graduate education at the NPS are to prepare officers to fill subspecialty positions.

This analysis initially assumes that the relevant law and instruction remain in force. The PWS developed here will reflect subspecialty-based graduate education. With this PWS, the relevant alternatives to NPS include outsourcing and privatization. Enrolling students in existing civilian graduate programs will not satisfy a subspecialty based PWS. As a result, educational vouchers and tuition costs to send students to civilian universities are irrelevant for this discussion. These alternatives will be addressed in the context of a general education PWS and educational objectives.

DoN Subspecialty Graduate Education Performance Work Statement

A subspecialty-based graduate education program provides students with the technical and analytical skills required in certain specifically identified and coded billets. A PWS that reflects NPS' current operations would include the following activities:[16]

- Military relevant graduate education that satisfies dual general education and subspecialty requirements and projected billet requirements
- Programs subject to biennial Navy flag-level curriculum sponsor review for military relevancy with the capability to swiftly implement desired course and program changes
- Institution devoted to graduate education (instruction by regular faculty; no teaching assistants)
- Atypical calendar and scheduling with heavier than normal class loads and full throttle operations 48 weeks per year
- Quarterly admissions with demand-driven course scheduling (courses scheduled to guarantee on-time graduation as opposed to minimum class size requirements)
- Admissions policy controlled by military performance instead of undergraduate grade-point average and standardized testing (e.g., GRE scores)
- Refresher courses to allow students to renew academic skills after several years of on-the-job performance

[14] Cavalluzzo and Cymrot (1998), pp. 63, 72-73.

[15] Graham (2000). See also Cavalluzzo and Cymrot (1998) pp. 5-6.

[16] These attributes are discussed in detail in Gates, W.R., X.K. Maruyama, J.P. Powers, R.E. Rosenthal, and A.W.M. Cooper, "A Bottom-Up Assessment of Navy Flagship Schools: The NPS Faculty Critique ofCNA's Report," NPSFC- 98-001, Monterey, CA: Naval Postgraduate School, November, 1998; and Mauz and Gates, 2000.

- Transitional courses to transform mid-career adult learners to new academic fields, as required by the military's policy against mid-career accessions in needed skill areas (e.g., Astronaut Winston Scott transitioned from an undergraduate music major to a MS in aeronautical engineering)
- Thesis required in all degree programs (increases relative intensity of faculty use)
- Military infrastructure superimposed on top of traditional academic infrastructure to maintain professional and military aspects of officer-student careers
- Infrastructure to support classified courses, laboratories and student/faculty research
- Faculty and students participating in reimbursable research projects on issues of interest to sponsoring (funding) agencies from the DoN and throughout the U.S. govemment[17]
- A student body combining junior officers from the Navy, Marine Corps, Army, Air Force, National Guard, civilian defense agencies and over 60 foreign countries (45 countries onboard in August 2000) to explore technical, operational and strategic problems.

This PWS integrates students, faculty and sponsors (curriculum and research) to produce an unparalleled mix of attributes that is not available in civilian graduate programs. If DoN wants to commercialize these attributes using civilian universities, it would have to establish Navy unique programs under civilian control. The winning contractor would need to make a significant investment in developing the required curricula, courses and faculty expertise.[18] This has two implications. The initial investment limits the scope for competition after awarding the initial contract. Furthermore, Navy leadership directly controls these performance attributes within NPS; they would be contractually controlled in civilian universities.

COST-EFFECTIVENESS IN DoN-FUNDED SUBSPECIALTY GRADUATE EDUCATION

Cavalluzzo and Cymrot (1998, pp. 64-71) provide data on annual educational costs for NPS and 28 civilian universities offering graduate engineering degrees.[19] These costs can be used to conduct a preliminary cost comparison between private sector and in-house government (NPS) production. This analysis assumes that NPS and civilian universities have adopted their MOE, as required by OMB-A 76. This analysis also ignores contract administration costs, tax implications and one-time conversion costs (including labor transition costs, and the civilian university's investment to develop Navy unique curriculum, courses and faculty expertise).

In comparing NPS' s costs to the price civilian universities would charge for outsourcing or privatizing subspecialty-based graduate education, civilian tuition rates are largely irrelevant. Endowments and state/local tax financing subsidize civilian tuition. In fact, 76.1% of all postbaccalaureate full-time students received financial aid in the 1995-96 academic year.[20] Civilian universities would likely view an outsourcing or privatization proposal as a business opportunity; they would enter such an agreement if profitable. Civilian universities don't likely have excess endowment funds or tax financing to subsidize DoN graduate education. Thus, the appropriate comparison involves the total cost to meet the PWS at both NPS and civilian universities. Later in this analysis, we will address the option of saving money by pursuing general education and simply paying tuition at civilian universities.

The Integrated Postsecondary Education Data System (IPEDS) cost data for NPS reported by Cavalluzzo and Cymrot reflects the PWS defined above. However, civilian university costs must be modified to account for differences between the PWS and standard civilian university programs.[21] Three PWS requirements will be considered in this cost analysis: academic calendar and course scheduling, dual general academic and subspecialty educational requirements, and sole focus on graduate education.[22] Normalizing for the remaining PWS requirements would further increase costs at civilian universities, but estimating their impacts is beyond the scope of this preliminary analysis.

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[17] The NPS FYOO reimbursable research program included over 500 funded projects as of I June 2000.

[18] Graham (2000) observes that "… there does not seem to be a part of any curricula that could not be taught by a civilian university if anyone were asked to structure and teach such a course for military students." While this is true, it ignores the initial investment civilian universities would require to provide military unique course material and the other attributes NPS currently offers.

[19] The costs reported here reflect data collected by the Integrated Postsecondary Education Data System (IPEDS). Research costs are reported as part of total educational costs in this database. This biases the cost analysis against schools with relatively high research budgets, but it does not significantly affect the conclusions drawn below.

[20] Digest of Educational Statistics, 1999, Table 327; National Center for Educational Statistics, September 1999

[21] Most past analyses comparing NPS and civilian universities, including both total educational and tuition costs, do not normalize NPS and civilian university costs to a common PWS. (Cavalluzzo and Cymrot, 1998; Graham, 2000)

Furthermore, educational costs are only a portion of DoN's total graduate education costs; DoN also pays the students' full salary and benefits while they attend in-residence graduate programs. Salary and benefit costs can be significant relative to educational costs and are important to consider if graduate programs differ in duration. As discussed below, this represents an important difference between NPS and civilian universities.

Integrated Postsecondary Education Data System (IPEDS) cost data were modified to normalize for the effects of NPS' unique academic calendar and course scheduling, dual general education and subspecialty academic requirements, focus on graduate education and student salary and benefit considerations.[23] The most critical adjustments include:

Academic Calendar and Course Scheduling The typical NPS student attends class 16 hours per week, 48 weeks per year (four 12-week quarters). This totals 768 hours of class instruction per year. In contrast, civilian-sector graduate students typically attend classes 13 hours per week for 32 weeks during the standard academic year (semester system), which equates to 416 hours. Some students attend classes seven hours per week for ten weeks during the summer. This totals 486 hours of instruction per year for the typical civilian-sector student attending summer classes.

Dual General Academic and Sub-Specialty Educational Requirements This analysis uses class hours as a proxy for course content. While class hours are an input to the education process, they can be used as a proxy for education as long as the rate at which faculty deliver and students absorb material is consistent across institutions. There is no reason to believe that NPS faculty and students are less able to deliver and absorb material than their civilian counterparts.

Cavalluzzo and Cymrot (1998) found that the average NPS curriculum is 22.8 months: 4.8 months for transitional and refresher courses and 18 months for graduate education. Only the 18 months of graduate education are relevant to a comparative cost analysis. Transitional and refresher courses reflect the Navy's policy of providing graduate education to mid-career adult learners and allowing students to switch to new academic areas to fill Navy needs (as required because Navy practice prohibits mid-career accessions to fill shortfalls). If the Navy adopted traditional civilian-sector admissions requirements, and only accepted qualified students, these courses could be eliminated from NPS' curriculum. If current NPS students were transferred to equivalent civilian-sector programs, these costs would be incurred at civilian universities.

The average NPS graduate program involves 1152 hours of class instruction; civilian universities would require 28 months to deliver an equivalent course content. If the typical civilian graduate programs covers two academic years, plus two summer terms (i.e., 24 months), they would include 972 hours of class instruction; NPS would require 15 months to deliver an equivalent course content. It is essential to normalize for program content before comparing NPS and civilian university graduate degree costs. This analysis will estimate comparative costs for both the 1152 class hour average NPS program and a hypothetical 972 class hour civilian graduate program.

Class hour differences between NPS and civilian university curricula largely reflect NPS' dual general academic and subspecialty-based requirements. Both NPS and civilian program lengths differ across curricula. For example, the standard NPS MS in Management graduate curriculum includes 960 graduate class hours (15 months); the standard civilian two academic year MBA program (no summer session) involves 832 graduate class hours. The 128 class hour difference between these two programs (representing two 4-unit NPS courses) reflects the additional cost of NPS' s dual degree requirements. It is beyond the scope of this paper to analyze the costs and benefits of subspecialty versus general graduate education; this analysis simply normalizes across programs for cost comparison purposes, using both the average NPS curriculum and a hypothetical two year civilian program.[24]

Focus on Graduate Education It is generally acknowledged that graduate education is

[22] For more detail see Gates, et al., 1998.

[23] For a more complete discussion see Gates, et al. (1998), pp. 11-22.

[24] However, it is informative to recall that current NPS curricula complete two separate reviews. They are reviewed for military relevancy during biannual flag-level curriculum reviews, where curriculum sponsors share DoN's desire to quickly return officers to the fleet. They are also reviewed for academic competency by the relevant academic accreditation board(s) following the accreditation cycle. These reviews help ensure that NPS curricula are academically rigorous, comprehensive and militarily relevant, but not wastefully expansive.

more expensive than undergraduate education. Larger undergraduate class size and instruction by graduate teaching assistants are at least two reasons to expect this cost difference. Graduate instruction and research also require more expensive equipment and specialized laboratories, especially if students are required to complete a Master's thesis. This is particularly significant for technical graduate programs. One analysis found that graduate education was two to three times as expensive as undergraduate education in studies conducted by Washington, Florida and Illinois.[25]

The IPEDS data reported by Cavalluzzo and Cymrot (1998) combine undergraduate and graduate costs. The civilian universities include graduate populations that range from 15% to 66% of the total student body; the weighted-average graduate population is 35%. Only some of these civilian graduate students are in engineering and other equipment and laboratory-intensive programs. NPS is 100% graduate students, with a relatively high percentage of students in technical and engineering graduate programs. This analysis adjusts civilian university costs, conservatively assuming that graduate programs are twice as expensive as undergraduate programs.

Student Salaries and Benefits As discussed above, the average NPS graduate program lasts 18 months (excluding transitional and refresher courses). This translates into a 28 month civilian graduate program. If tenures differ at NPS and civilian programs, cost comparisons must include the students' salaries and benefits. This is a significant portion of the total cost of graduate education for DoN officers. Using the Military Composite Standard Pay Rates,[26] the greater course length at a civilian university would equate to $75,840 more per degree for pay and allowances than at NPS (ten additional months at a $91,013 annual military composite standard pay rate for salary and benefits, using the current NPS students' rank structure).[27] Furthermore, approximately 58% of NPS students live in base housing, and support costs for Family Housing

[25] Peter D. Syverson and Moira J. Maguire, "Estimating Institutional Costs of Graduate Education: Reports from Three States Demonstrate Promise, Pitfalls of Cost Studies," Council of Graduate Schools, 1997.

[26] Memorandum of June 30, 2000, OSD FY 2002/2003 Defense Budget Review Guidance, Attachment 6.

[27] This student salary and benefit penalty falls to $68,260 per degree for a hypothetical 972 class hour civilian university graduate program.

TITLE

Talking Paper: Value of NPS

AUTHOR

CAPT Paul Shemella (Ret.)
NPS Internal Document • March 2011

ABSTRACT

This paper focuses on the most important factors of the Naval Postgraduate School that distinguish it from other educational institutions and that justify keeping it functioning despite a "declining budget climate." NPS' quality education, valuable research, and its unique curricula in training military officers are stressed.

EXCERPTS

"No institution can do what NPS does as well as NPS does. The National Defense University comes closest, but it has limited capacity and shorter courses. Like the other war colleges, NDU's role is teaching military officers how to develop joint strategy and operations; NPS' role is to teach military officers how to think critically and holistically, producing an officer who can quickly understand a complex situation and collaborate with anyone to achieve a successful outcome."

"NPS has human resources unmatched in the US government for teaching, targeted research, and constantly emerging specialized courses. The school is a large network, connected to many other networks. We are a 'hot spot' for creativity in defense and security issues, collaborating with smart people with the best ideas from our network of networks."

"NPS responds quickly to the needs of the Combatant Commands, Service headquarters, and other sponsors from across government. New courses and programs are created from nothing faster than anywhere else."

"NPS draws resources from myriad institutions, both public and private. For a relatively low fixed cost, this 'intellectual gravitation' brings in enormous amounts of money to produce officers with critical thinking and technical skills, as well as deliverable products for decision-makers."

"Measurable and anecdotal evidence indicates that NPS provides high-quality education, valuable research, responsive special programs, and very important capacity building in most of the world's countries."

CD REF NO. PW–18

Talking Paper
Value of NPS

PURPOSE

To summarize the most important arguments for allowing NPS to continue thriving in a declining budget climate.

MAIN QUESTIONS AND ANSWERS.

***What do we do?**

- Teach graduate education to military officers from around the world; conduct cutting·edge research in policy and technical areas; provide quick response to fleet and CO COM requirements; and conduct capacity-building programs in partner nations.

***How well do we do it?**

- Measurable and anecdotal evidence indicates that NPS provides highquality education, valuable research, responsive special programs, and very important capacity building in most of the world's countries.

***Why is what we do important?**

- Education is one leg of the professional success triad. Military officers must succeed in each of three spheres of endeavor: the operational, the managerial, and the educational. As the wars in Iraq and Afghanistan wind down, the educational sphere will become even more critical... who thinks, wins.

- Research helps government institutions anticipate future defense and security challenges. Without it, resources cannot be invested wisely and military officers face the future unprepared to fight.

***Who else can do what we do?**

- No institution can do what NPS does as well as NPS does. The National Defense University comes closest, but it has limited capacity and shorter courses. Like the other war colleges, NDU's role is teaching military officers how to develop joint strategy and operations; NPS' role is to teach military officers how to think critically and holistically, producing an officer who can quickly understand a complex situation and collaborate with anyone to achieve a successful outcome.

***NPS has anticipated all the major trends in security over the last twenty years. What is next for NPS to anticipate?**

- Capacity building for security institutions in North Africa and the wider Middle East (after the region's new and more democratic governments settle down).

***What distinguishes NPS from other educational institutions the Navy could use?**

- *Context*. NPS classroom are populated with all US military services and international officers from all regions — and a growing number of other government institutions. NPS is a defense and security institution that places all education into this context. Students create lifelong bonds of trust and friendship — across Services and across borders.

- *Content*. NPS has accumulated (and continues to grow) an astonishing body of knowledge, available to all US Government officials and most US citizens. This content is continually updated and enriched by officers with field experience across the spectrum of security operations.

- *Critical Mass of Scholarship*. NPS has human resources unmatched in the US government for teaching, targeted research, and constantly emerging specialized courses. The school is a large network, connected to many other networks. We are a 'hot spot' for creativity in defense and security issues, collaborating with smart people with the best ideas from our network of networks.

- *Institutional Agility*. NPS responds quickly to the needs of the Combatant Commands, Service headquarters, and other sponsors from across government. New courses and programs are created from nothing faster than anywhere else.

- *Leverage*. NPS draws resources from myriad institutions, both public and private. For a relatively low fixed cost, this 'intellectual gravitation' brings in enormous amounts of money to produce officers with critical thinking and technical skills, as well as deliverable products for decision-makers.

TITLE

Seven Reasons to Preserve and Exploit the Naval Postgraduate School

AUTHOR

CAPT Wayne P. Hughes, Jr. (Ret.) • 16 July 2003

ABSTRACT

Hughes outlines why he believes the Naval Postgraduate School is the "best source and has no rival" in training military officers seeking a graduate education. He states that the value of NPS is supported by the following seven factors.

1. "NPS education cannot be duplicated. There is no alternative to NPS education anywhere, including AFIT and the War Colleges, not even close."

2. "The basis of NPS research is unique because it is oriented to fleet operations that no other university can match."

3. "The interdisciplinary characteristics of both education and research are tailored to the needs of the Navy. In these NPS has no peer. We know where and how our graduates will serve; therefore the education is tailored for military service and leadership."

4. "Setting aside the unmatched content of NPS education, an NPS master's degree is also cost competitive when measured in student-faculty contact."

5. "No civilian university is as adaptive in making abrupt changes of subject matter or even entire curricula to match changing defense missions, new technologies, and career demands … Curricula tailored to the needs of Navy combat officers and homeland security civilians have introduced radically new delivery methods matched by only a handful of other forward-leaning institutions."

6. "The quality of our education is unmatched by foremost civilian universities because at NPS no courses are taught by teaching assistants or Ph.D. students. Military faculty from the Army, Navy, and Air Force, all with advanced degrees, integrate defense-relevant subject matter in a way that has no counterpart at civilian institutions."

7. "As defense emphasis shifts from NATO and Europe to Asia, NPS has added relevance and proximity to the new centers of interest."

"To sum up, there is no alternative to the Naval Postgraduate School. If the Navy has a need for graduate education in its officer corps, whether degree programs or short courses, the Naval Postgraduate School is the best source and has no rival."

CD REF NO. PW–19

16 JULY 2003

Seven Reasons to Preserve and Exploit the Naval Postgraduate School

WAYNE P. HUGHES, JR.

1. ***Education*** NPS education cannot be duplicated. There is no alternative to NPS education anywhere, including AFIT and the War Colleges, not even close.
   - We design our courses to take advantage of our homogenous student body. They are mature officers with four to eight years of experience in their profession, devoted to national service, and appreciative of the opportunity for a paid education.
   - Every graduate writes a master's thesis tutored by an individual faculty member, or participates in a major study accomplished in collaboration with a faculty team.

2. ***Research*** The basis of NPS research is unique because it is oriented to fleet operations that no other university can match. Our research has three distinctions.
   - Nearly all of it is DoD sponsored and funded, in competition with foremost research universities.
   - The collaborative research across campus that is the hallmark of the three institutes is unmatched not only because they sponsor interdisciplinary studies but also because the work is in military "disciplines" such as undersea warfare, expeditionary warfare, information operations, and command and control.
   - The student thesis work (performed by nearly every graduate — around 600 per year) is low-cost, with high payoff to the sponsors because it is done by officers who know their profession.

3. ***Customer*** The interdisciplinary characteristics of both education and research are tailored to the needs of the Navy. In these NPS has no peer.
   - We know where and how our graduates will serve; therefore the education is tailored for military service and leadership. Another graduate school, even a law, medical, or business school, must dilute its curriculum content to cover the profession's many variations. Nor would a civilian school adapt or intensify its curricula to meet Navy needs.
   - In both technology and policy sciences, faculty research is slanted toward defense needs because that is the only way to keep courses up to date.

4. ***Cost*** Setting aside the unmatched content of a NPS education, an NPS master's degree is also cost competitive when measured in student-faculty contact.
   - How could it be otherwise? We teach with unmatched intensity: 48 weeks a year, delivering an average of four courses totaling an average of 16 contact hours during those 48 weeks.
   - We commence curricula and short courses to meet Navy and DoD needs at odd times of the year that a civilian university would reject as unorthodox.
   - In a typical NPS curriculum half or less of the courses fulfill the degree requirements for a university master's degree program. The other half is devoted to preparing the student for graduate study and to enrichment courses beyond the master's level. The latter courses respond to Navy sponsor requirements, often including Professional Military Education.

5. ***Response*** No civilian university is as adaptive in making abrupt changes of subject matter or even entire curricula to match changing defense missions, new technologies, and career demands.
   - Short courses deliver certificates and diplomas each year, either in residence or by Dis-

tance Learning, often in partnership with leading universities. Short course emphasis is on currency with the latest information in the field.
- Resident programs are kept up-to-date in computer and information technology, ship design, cryptology and information assurance, and space engineering and operations, among others.
- Curricula tailored to the needs of Navy combat officers and homeland security civilians have introduced radically new delivery methods matched by only a handful of other forward-leaning institutions.

6. ***Faculty*** The quality of the NPS faculty corresponds to that of upper-tier universities. The quality of our education is unmatched by foremost civilian universities because at NPS no courses are taught by teaching assistants or PhD students. Military faculty from the Army, Navy, and Air Force, all with advanced degrees, integrate defense-relevant subject matter in a way that has no counterpart at civilian institutions.

7. ***Location*** For many years NPS has looked west into the Pacific and Indian Oceans and has more ties to Pacific Commands than in the European theater.
   - As defense emphasis shifts from NATO and Europe to Asia, NPS has added relevance and proximity to the new centers of interest.

   The reason the cost of living is high in Monterey is because it is a very attractive location once housing costs are contained.
   - Housing and BAQ costs for students are avoided because student housing is already in place.
   - Housing costs for faculty have emerged in the last decade as a serious handicap in hiring promising young faculty. A program of affordable faculty housing has been initiated at no cost to the government similar to what other universities have had to undertake and pay for in high-cost areas.

To sum up, there is no alternative to the Naval Postgraduate School. If the Navy has a need for graduate education in its officer corps, whether degree programs or short courses, the Naval Postgraduate School is the best source and has no rival.

TITLE

Closure or Realignment of the Naval Postgraduate School

SOURCE

Impact Study, NPS Internal Document, Author Unknown, Date Unknown

ABSTRACT

The significant costs of either closing the Naval Postgraduate School or relocating its programs to other Naval facilities are reviewed. Also discussed are attributes that make NPS successful and argue against closing the institution. These include NPS' high academic standards, its top-notch research faculty conversant with the unique needs of the military service, its unique facilities, and its student body comprised of U.S. and international officers. Also stressed is NPS' role in developing the first graduate program in Homeland Security after 9/11.

EXCERPTS

"There are no other institutions in the US, or anywhere else in the world, with a similar synergistic system of faculty, students and R&D programs focused on the unique needs of national defense and homeland security."

"More generally, the synergistic combination of graduate education in disciplines and curricula critical to the future of our defense establishment with high-impact research in crucial technologies directly relevant to DOD's mission is simply not found in either national laboratories with no capacity or interest in educating military officers or in civilian universities that engage in little or no defense R&D."

"If we close NPS and disperse its students to civilian institutions we will lose these unique capabilities and we will never recover them … Moving selected components of the NPS to collocate with other Naval facilities will also lead to the loss of most of our research faculty and their unique skills and knowledge."

"NPS is an ideal institution to provide crucial intellectual leadership, studies, and research in our pursuit of the Global War on Terrorism … The agility, responsiveness, and relevance of NPS intellectual capital was most recently demonstrated when we conceived, developed, and delivered the country's first graduate program in Homeland Security within fifteen months of 9/11."

"The nation's ability to respond swiftly and effectively to other homeland security emerging crises will be significantly reduced if the NPS assets are thrown away by an ill-advised decision to close or realign the institution."

"Future multinational operations that will be ever more important as we wage the GWOT will suffer if the extensive mutual understanding, trust, and goodwill that results from intensive interactions across this 'global' population of future military leaders are terminated by the closure of NPS."

CD REF NO. PW–20

Closure or Realignment of the Naval Postgraduate School

- IMPACT STUDY –

ISSUE

Through two world wars, Korea, Vietnam, and the Cold War strategic thinking and forward-looking military officers, government officials and members of congress have built and supported a major research university dedicated to the nation's military needs: the Naval Postgraduate School. Today, this sustained investment is in danger of being abandoned either by the closure of NPS or an attempt to relocate selected programs to other Naval facilities. There are significant costs associated with either of these actions. We will examine some of the more significant outcomes here.

BACKGROUND

The Navy and our sister service need a high percentage of officers with a graduate-level understanding of science, technology and management, along with a good understanding of systems engineering and integration, all developed within the context of military systems. In the NPS, the nation has a research university uniquely positioned to fill these needs. NPS has assembled a top-quality research faculty that is successful in the highly competitive world of research funding and that has established partnerships with peers at other major research universities and with the industrial base of the nearby Silicon Valley. We have created a student body representing the full spectrum of the total US force along with the best of our allies. There are no other institutions in the US, or anywhere else in the world, with a similar synergistic system of faculty, students and R&D programs focused on the unique needs of national defense and homeland security.

ANALYSIS

Research is a fundamental part of the NPS mission. Research creates and disperses new knowledge to the USN and the DOD. The NPS R&D program provides a major source of analytical capability for the Navy and the rest of DOD, leads to innovative and relevant solutions to warfare problems, and provides graduates who bring the new knowledge back to the Fleet. In FY03 NPS carried out over $60M of defense-related R&D; almost $25M was in direct support of Navy problems. Various program managers and other senior DOD/DON managers who are interested in getting the best return possible on their R&D investments provide this R&D support. There are three components that make this possible. We have recruited and developed a *top-rated research* faculty who have invested the time and effort needed to become conversant with the unique needs of the military services — this represents a unique capability not found in any other educational establishment. We have built a number of *unique facilities* that allow us to carry out very relevant R&D projects — for example, we have invested over $5M in developing airfield and hanger facilities to enable us to operate a fleet of fixed wing and UAV aircraft in airspace that is restricted for our use only and in which we can fly UAVs. In fact, we fly the only UAV's that can be reconfigured for experimentation purposes. As another example of a unique facility, we have adapted the old SOSUS Station at Pt. Sur as an Ocean Acoustics Lab that can be operated either at a classified or unclassified level. We are also one of a very few facilities to operate our own Linear Accelerator. The third component of our success is our *student body* — we involve our officer-students in cutting-edge research that uses their up-to-date knowledge of current military operations to keep the research firmly focused on the needs of the military services. **If we close NPS and disperse its students to civilian institutions we will lose these unique capabilities and we will never recover them: the faculty who are central to operating this enterprise will migrate to other research universities. Mov-**

ing selected components of the NPS to collocate with other Naval facilities will also lead to the loss of most of our research faculty and their unique skills and knowledge. We will also be forced to abandon the aviation and ocean facilities that are in use today. Finding other airspace, for example on the East coast, that will allow the 24/7 operation of UAVs at altitudes up to and in excess of 15000 feet will, most likely, be impossible.

The events of September 11, 2001 created an unprecedented focus on homeland security & homeland defense for the United States, and have necessitated significant changes to the way our nation plans and executes our security and defense strategy. The Global War on Terrorism (GWOT) is the most important national security challenge we face as a nation. With more than four hundred faculty and nearly fifteen hundred military and operationally experienced international, national, state and local government level graduate students, engaged in national security programs and projects, NPS is an ideal institution to provide critical intellectual leadership, studies, and research in our pursuit of the Global War on Terrorism. The agility, responsiveness, and relevance of NPS intellectual capital was most recently demonstrated when we conceived, developed, and delivered the country's first graduate program in Homeland Security within fifteen months of 9/11. Integrating our expertise in national security, information warfare, cybersecurity, maritime domain awareness and related subjects, NPS was able to respond to the Department of Homeland Security's immediate need to provide advanced education to federal, state and local officials in areas that simply did not exist before September 2001. **The nation's ability to respond swiftly and effectively to other homeland security emerging crises will be significantly reduced if the NPS assets are thrown away by an ill-advised decision to close or realign the institution.**

Another major NPS contribution, largely unheralded, is the enormous impact of having over three hundred allied and international officers spending 18–24 months living, learning and discovering side by side with Navy, Marine, Army and Air Force officers how to conceptualize, analyze, and solve the global challenges that we all face in the 21st century. While difficult to measure, the extensive mutual understanding, trust, and goodwill that results from intensive interactions across this 'global' population of future military leaders may, in fact, contribute as much to international peace and harmony as does their formal education itself. As future military operations become both more joint and international, it is imperative that our officers understand, appreciate, and interact with their foreign counterparts with sensitivity, intelligence, and grace that can only come from sustained experience with our international allies and partners across the globe. NPS provides an ideal environment for those relationships to flourish. **Future multinational operations that will be ever more important as we wage the GWOT will suffer if the extensive mutual understanding, trust, and goodwill that results from intensive interactions across this 'global' population of future military leaders are terminated by the closure of NPS.**

There is a compelling need for innovative solutions to the well-documented critical shortage of science and technology workers in the DOD, other branches of government, and the civilian national security workforce. As an example, the Office of Naval Research has estimated that Navy labs alone will need to hire up to 400 people (with graduate degrees in science and engineering) a year over the next ten years to replace its existing US citizen workforce. As one solution, OSD is currently examining creation of a new National Defense Education Act of 2006 to fund the S&T education of US citizens in scholarship-for-service programs. Graduates would have a specific federal employment payback period dependent on the duration of their federal support. Given the magnitude of the workforce shortage, it is likely that a transformational change is required to address this problem. Just as the nation found it necessary to create the USMA, USNA, and the USAF to provide a rigorous military education for future military officers, it may be time for a federally-funded university system to lead the education of the future US civilian S&T national security workforce. The Naval Postgraduate School is well suited to lead in the development of a federal university system. **A tactical decision to close the School at this critical time in the nation's efforts to increase the supply of defense scientists and engineers would be a failure to recognize the strategic issues involved and would reduce the nation's capacity to meet these needs. This is particularly damaging since NPS is the nation's ninth largest annual producer of S&T master's degrees.**

The environment in which our forces will operate in the future will be dominated by speed: the speed with which we can understand our environment; the speed with which we share that understanding; the speed with which we make decisions; and the speed with which our desired effects are achieved. The great advances that have taken place and are still taking place in the worlds of information technology and networking drive are making this possible. Many of the research developments in the IT world are happening close to NPS in the Silicon Valley. Being a research university with a very active IT research program located next door to this R&D

activity, the NPS is in an ideal position to form partnerships and participate in ongoing research efforts with universities such as Stanford and UCB, and with the many corporations and small companies in the area. **This immediate access to cutting-edge IT R&D work will be terminated or seriously reduced if NPS is closed.**

NPS is ideally located to serve as a linchpin in bringing together researchers at California's outstanding universities, researchers from national labs such as LLNL, and NPS faculty and students to work on problems of national defense and homeland security, such as problems involving the security of the shipping container system. The Navy also benefits in many ways from the partnerships that NPS has established with the other oceanographic laboratories that are collocated on Monterey Bay. But, neither LLNL nor the civilian universities can provide the integrated military-academic environment needed for the education of military officers. **More generally, the synergistic combination of graduate education in disciplines and curricula critical to the future of our defense establishment with high impact research in crucial technologies directly relevant to DOD's mission is simply not found in either national laboratories with no capacity or interest in educating military officers or in civilian universities that engage in little or no defense R&D.**

Finally, the reasons why NPS is and should be in Monterey remain much the same as they were when NPS was established: access to open ocean, access to ranges and uncontrolled airspace, and a city that is not a distraction to the officer students.

RECOMMENDATION

It is in the nation's best interests that you make every effort possible to make OSD/DON understand the enormous cost of closing or realigning the NPS.

EDUCATION AND TRAINING JOINT CROSS SERVICE GROUP
PROFESSIONAL DEVELOPMENT EDUCATION SUBGROUP

JPME/PME

Installation/Location	Numerical Military Value Score
Marine Corps Base Quantico, VA	65.3
Ft. Leavenworth, KS	59.3
Maxwell AFB, AL	53.8
Carlisle Barracks, PA	53.6
Ft. McNair, DC	52.7 *
Naval Station Newport, RI	52.5
Naval Station Norfolk, VA	47.5
Graduate Education	
Monterey, CA (Naval Postgraduate School)	74.7
Wright-Patterson AFB, OH (Air Force Institute of Technology)	52.0
Other Full Time Education (Defense Agencies)	
Ft. Belvoir, VA (Defense Acquisition University)	58.8
Memphis, TN (Defense Contract Audit Institute)	40.5
Patrick AFB, FL (Defense Equal Opportunity Management Institute)	43.7
Other Full Time Education (Chaplains)	
Ft. Jackson, SC	51.6
Maxwell AFB, AL	41.3
Naval Station Newport, RI	34.1
Other Full Time Education (JAGs)	
Maxwell AFB, AL	45.4
Charlottesville, VA	33.5
Naval Station Newport, RI	33.2

** Fort McNair's military value score did not include data for Lincoln Hall nor buildable acres, reference 2 Feb 05 E&T JCSG meeting minutes.*

Area	NPS Mil Value Ranking
Air Platforms Research	14 of 35
Battlespace Environments Development & Acquisition	1 of 21
Battlespace Environments Research	3 of 25
Biomedical Research	23 of 30
Chemical & Biological Defense Development & Acquisition	32 of 40
Chemical & Biological Defense Research	10 of 42
Ground Vehicles Research	13 of 24
Human Systems Development & Acquisition	17 of 87
Human Systems Research	13 of 65
Information Systems Development & Acquisition	66 of 105
Information Systems Research	4 of 68
Materials & Processes Research	18 of 46
Nuclear Technology Research	4 of 15
Sea Vehicles Research	11 of 36
Sensors, Electronics & Electronic Warfare Development & Acquisition	39 of 103
Sensors, Electronics & Electronic Warfare Research	20 of 68
Space Platforms Research	10 of 26
Weapons and Armaments Research	24 of 60

TITLE

Naval Postgraduate School Talking Points

SOURCE

NPS Internal Document, Author Unknown, Date Unknown

ABSTRACT

Fourteen talking points make a strong case for the value and necessity of the Naval Postgraduate School. One of the most important points is that NPS is the only institution in the world with similar faculty, students and R&D programs focused on national defense and homeland security.

EXCERPTS

"To be effective in the 21st century the Navy and our sister services need a high percentage of officers with a graduate-level understanding of science, technology and management, along with a good understanding of systems engineering and integration: NPS fills this need."

"The nation's ability to respond swiftly and effectively to homeland security and other emerging crises would be significantly reduced without NPS assets."

"The recent stand up of Cyber Command shows that cybersecurity is a major warfare area in today's world. NPS has extensive programs and is doing cutting-edge research in support of cybersecurity including, but not limited to, network security, identity management and media exploitation."

"We involve our officer-students in cutting-edge research that uses their up-to-date knowledge of current military operations to keep the research firmly focused on the needs of the military services."

"We have a top-rated research faculty who have invested the time and effort needed to become conversant with the unique needs of the military services. We have an international student body."

"Future multinational operations are supported by the extensive mutual understanding, trust, and goodwill that results from intensive interactions across our 'global' population of future military leaders."

CD REF NO.

PW–21

Naval Postgraduate School Talking Points

1. To be effective in the 21st century the Navy and our sister services need a high percentage of officers with a graduate-level understanding of science, technology and management, along with a good understanding of systems engineering and integration: NPS fills this need.

2. According to James Colvard: "The Navy has lowered its level of intellectual involvement in research and development and weakened its entire infrastructure, which at the end of WWII was the strongest in the world. For a service that sleeps on its weapons, this weakened institutional position in the world of science and engineering is dangerous." NPS can be a major player in helping the Navy overcome this weakness by extending programs of study and research to an expanded student base that includes more civilians.

3. There are no other institutions in the US, or anywhere else in the world, with a similar synergistic system of faculty, students and R&D programs focused on the unique needs of national defense and homeland security.

4. Research is a fundamental part of the NPS mission.

5. We have a top-rated research faculty who have invested the time and effort needed to become conversant with the unique needs of the military services. We have an international student body.

6. We have built a number of unique facilities for highly military relevant experimentation and own access to unlimited airspace at Camp Roberts.

7. We involve our officer-students in cutting-edge research that uses their up-to-date knowledge of current military operations to keep the research firmly focused on the needs of the military services.

8. The nation's ability to respond swiftly and effectively to homeland security and other emerging crises would be significantly reduced without NPS assets.

9. Future multinational operations are supported by the extensive mutual understanding, trust, and goodwill that results from intensive interactions across our 'global' population of future military leaders.

10. As the nation's ninth largest annual producer of S& T master's degrees, NPS plays a strategic role in the nation's efforts to increase the supply of defense scientists and engineers.

11. Being a research university with a very active IT research program located next door to the R&D activities of the Silicon Valley and the heart of the UC system, the NPS is in an ideal position to form partnerships and participate in ongoing research efforts with universities such as Stanford, UCB, UCSC, UCSB, and with the many corporations and small companies in the area.

12. The recent stand up of Cyber Command shows that cybersecurity is a major warfare area in today's world. NPS has extensive programs and is doing cutting-edge research in support of cybersecurity including, but not limited to, network security, identity management and media exploitation.

13. This immediate access to cutting-edge IT R&D activity enhances NPS' value to the Navy.

14. The NPS was created and nurtured by the Navy to develop the technical, management

and policy skills of operationally successful Naval officers, and to enhance the overall combat-effectiveness of our armed forces by carefully crafted post-baccalaureate professional programs of study built on basic and applied research carried out by teams of officer-students working in conjunction with high-quality faculty.

TITLE Naval Postgraduate School Curricula

SOURCE NPS Internal Document, Author Unknown, Date Unknown

ABSTRACT The reasons why the Naval Postgraduate School was developed and the purpose behind its curricula are reviewed. Details discussed include NPS' curricula and how it is structured to offer a year-round program of courses that most effectively meet the Navy's needs while making the best use of officers' time.

EXCERPTS

"The key phrase is 'operationally successful.' It is and has always been Navy policy to select officers for professional development based on their operational experience and the needs of the service, regardless of their undergraduate experience."

"Curricula at NPS have been carefully designed to meet these Navy requirements, and to make the most effective use of the most precious Navy asset, the officer's time."

"The challenge that NPS has faced successfully was to create a learning environment that meets all of the Navy's requirements. … Each curriculum is a highly connected network of graduate and professional course and research projects designed to provide the level, breadth, and depth of academic and professional knowledge essential to the professional and technical development of the officer and the Navy. This is considerably above the level of commitment required to obtain a master's degree: more than 100 hours of credit compared to the 40 or so hours typical of a master's degree program."

"When alternate approaches to meeting the Navy's (and other services and our international allies) needs are under discussion it is vital that the mistake of assuming that NPS merely awards degrees is avoided. To repeat: The NPS was created and nurtured by the Navy to carry out one critical task: to develop the technical, management and policy skills of operationally successful Naval officers, and to enhance the overall combat-effectiveness of our armed forces by carefully crafted post-baccalaureate professional programs of study built on basic and applied research carried out by teams of officer-students working in conjunction with high-quality faculty. Simply sending officers to civilian universities to obtain a master's degree will not suffice!"

CD REF NO. PW–22

Naval Postgraduate School Curricula

The NPS was created and nurtured by the Navy to carry out one critical task: to develop the technical, management and policy skills of operationally successful Naval officers, and to enhance the overall combat-effectiveness of our armed forces by carefully crafted post-baccalaureate professional programs of study built on basic and applied research carried out by teams of officer-students working in conjunction with high-quality faculty.

The key phrase is "operationally successful". It is and has always been Navy policy to select officers for professional development based on their operational experience and the needs of the service, regardless of their undergraduate experience. This requirement implies a need to update and to enhance the undergraduate educational experience of those officers who have been selected for further professional study, particularly since in most cases the time gap between completion of undergraduate work and selection is measured in years.

Curricula at NPS have been fully designed to meet these Navy requirements, and to make the most effective use of he most precious Navy asset, the officer's time. Curricula can be divided into four interlocking phases: skill reconstruction and preparatory study; a wide ranking series of graduate-level courses that are the equivalent of a master's degree program at most good, tier 1 universities; a carefully selected research topic along with professional enhancement courses created in consultation with senior Navy leaders; and Joint Professional Military Education courses. All together these four phases form an essential unity in the professional and technical development of our officer corps. The degree is a by-product, but a very importance one, of this development process.

The challenge that NPS has faced successfully was to create a learning environment that meets all of the Navy's requirements. This was done by establishing a year-round program of courses that permit students to take a full load in each quarter. In addition, a series of carefully designed up date-of-skills and preparatory courses was introduced to bring the incoming students' academic knowledge base up-to-date. Each curriculum is a highly connected network of graduate and professional course and research projects designed to provide the level, breadth, and depth of academic and professional knowledge essential to the professional and technical development of the officer and the Navy. This is considerably above the level of commitment required to obtain a master's degree: more than 100 hours of credit compared to the 40 or so hours typical of a master's degree program.

When alternate approaches to meeting the Navy's (and other services and our international allies) needs are under discussion it is vital that the mistake of assuming that NPS merely awards degrees is voided. To repeat: The NPS was created and nurtured by the Navy to carry out one critical task: to develop the technical, management and policy skills of operationally successful Naval officers, and to enhance the overall combat-effectiveness of our armed forces by carefully crafted post-baccalaureate professional programs of study built on basic and applied research carried out by teams of officer-students working in conjunction with high-quality faculty. Simply sending officers to civilian universities to obtain a master's degree will not suffice!

TITLE

A Bottom-Up Assessment of Navy Flagship Schools: The NPS Faculty Critique of CNA's Report • November 1998

REF NO. NPS-FC-98-001

AUTHORS

William R. Gates
Associate Professor, Department of Systems Management
Xavier K. Maruyama
Professor, Department of Physics
John P. Powers
Professor, Department of Electrical and Computer Engineering
Richard E. Rosenthal
Professor and Chairman, Department of Operations Research
Alfred W. M. Cooper
Professor and Faculty Chairman, Department of Physics

PREPARED FOR Faculty Council, Naval Postgraduate School, Monterey CA 93943

ABSTRACT

Although the CNA report found that NPS' master's level quality to be high, it stated that NPS has the highest per-student expenditure compared to other top-level schools offering a graduate-level technical education. However, in responding to the report, NPS' main criticism of the CNA report is that it did not consider NPS' unique benefits and differences between NPS' militarily-directed graduate program and civilian graduate programs that make it difficult to compare these institutions regarding true costs.

EXCERPTS

"CNA found the program costs at NPS to be much higher than the tuition costs at 28 other universities referenced in the study. However, we feel that the CNA study contains two crucial flaws that bias the comparison against NPS. First, in comparing costs between NPS and civilian alternatives, CNA fails to hold the desired outputs constant. Second, for both NPS and civilian institutions, CNA gives an incomplete measure of costs. Our analysis shows that the major factors of cost are the officer salaries and housing costs and, hence, the program duration. Additional significant cost factors are the year-round operation of NPS and the higher student contact-hour loads at NPS … Computing the cost per class hour … NPS is the least expensive of the alternatives."

"In particular, NPS' graduate education cost is $159 per class hour, as found above; civilian-sector costs with graduate premiums range from $525 per class hour at Cal Tech to $282 per class hour at the University of Texas-Austin. The weighted civilian-sector average costs with the graduate premium is $318 per class hour."

"The IPEDS data reported by CNA indicate that NPS has higher annual costs per FTE than comparable civilian-sector schools. However, this comparison does not indicate that civilian universities could more cost-effectively provide the services NPS offers. In particular, NPS and civilian schools can not be com-

pared on the basis on the IPEDS data; NPS' unique mission and officer body is not comparable to civilian universities without further adjustments."

"The Committee believes that the primary question that should have been addressed in any outside study of NPS is whether NPS has accomplished its mission. Does NPS contribute to the combat-effectiveness of the Navy? While we answer this question strongly affirmative, the CNA study would have been an opportune time for an independent answer. We believe the issues raised in our report are relevant if this inquiry is made."

Vice Admiral John Scott Redd, Director for Strategic Plans and Policy of the Joint Staff, earned an M.S. in operations research with distinction from NPS in 1978: "The purpose of this letter is to put in writing my feelings on the value of the education I received at the Naval Postgraduate School and its impact on my career … the education I acquired there has proven priceless. I have experienced first-hand the critical importance of higher education in a naval officer's career."

CD REF NO. PW–23

NOVEMBER 1998

A Bottom-Up Assessment of Navy Flagship Schools:

THE NPS FACULTY CRITIQUE OF CNA'S REPORT

BY WILLIAM R. GATES, XAVIER K. MARUYAMA, JOHN P. POWERS, RICHARD E. ROSENTHAL, AND ALFRED W. M. COOPER

This report was sponsored by the Faculty Council of the Naval Postgraduate School. It was endorsed by the Faculty at the Spring Faculty Meeting, 1998.

EXECUTIVE SUMMARY

The Navy has established a program of mid-career, professional, graduate education at the Naval Postgraduate School to meet its needs for a technically qualified, intellectually equipped officer corps. In addition, the graduate education program provides an opportunity for the Navy to transition officers from one set of skills developed in their undergraduate education to another that meets the Navy's current needs. Another benefit is the expertise in military-relevant topics that has developed in the faculty and students, leading to a vigorous graduate-education research program in support of the Navy and the Department of Defense.

The Center for Naval Analyses (CNA) recently published its assessment of the Navy's flagship educational institutions, including the Naval Postgraduate School (NPS). The report found the quality of the NPS program to be high. In assessing the level of funding required to maintain the excellence of the Navy's flagship institutions, CNA explored the costs of using civilian-sector universities to obtain the same product. Two such approaches would be to send officers to civilian universities to obtain graduate education or to contract with a civilian university to operate NPS.

CNA found the program costs at NPS to be much higher than the tuition costs at 28 other universities referenced in the study. However, we feel that the CNA study contains two crucial flaws that bias the comparison against NPS. First, in comparing costs between NPS and civilian alternatives, CNA fails to hold the desired outputs constant. Second, for both NPS and civilian institutions, CNA gives an incomplete measure of costs. Our analysis shows that the major factors of cost are the officer salaries and housing costs and the program duration. Additional significant cost factors are the year-round operation of NPS and the higher student contact-hour loads at NPS.

Incorporating the salary and housing costs in this study, we find that NPS is the 8th least expensive of the 29 universities considered by CNA. Computing the cost per class hour (including the officers' salaries and housing), NPS is the least expensive of the alternatives.

The existence of NPS is due to the benefits that NPS offers to the professional and technical development of the officer corps. Among these benefits are:

1. Military, technical relevance of courses, theses, and curriculum content
2. Specialized educational laboratory facilities devoted to military hardware and computer systems
3. Officers and faculty with military expertise who produce analyses and research products that benefit the Navy and DoD
4. An admissions system with primary emphasis on military performance and secondary emphasis on academic performance
5. Refresher and transition mechanisms that ef-

ficiently and effectively meet the need to allow for a time delay between undergraduate and graduate studies and for the assignment of officers to curricula that meet current Navy personnel requirements
6. An instructional tempo that operates year-round and allows higher-than-average course loads
7. Military infrastructure that allows the officers to remain in a professional military environment while at school, including opportunities for interaction with officers from other services and countries.

Comparing tuition at civilian universities to the NPS program cost (per year per student), NPS is most expensive of the 29 universities included in CNA's study. However, such a comparison is flawed since tuition costs alone do not measure the complete costs of providing graduate education to a military officer in the civilian-sector. The following factors are necessary components of a complete cost-effectiveness analysis:

1. The officer-student's salary, benefits, and housing allowance should be considered. These costs exceed any tuition payments and are very sensitive to the cost of housing and the length of programs. NPS has existing base housing, which is less expensive than housing in the civilian-sector. In addition, the average NPS masters program is 1.2 months shorter than the average masters program taken by Navy URL officers enrolled in civilian universities.

2. The role and cost of transition and refresher courses also must be incorporated into the analysis. These courses support the Navy's policy decisions to provide mid-career education to its officers and to transition officers into areas of expertise to meet Navy needs.

3. The higher contact-hour load carried by the officers receiving graduate education at NPS should also be added to the analysis. NPS officers attend approximately 768 hours of instruction annually, compared with approximately 486 hours per year at a civilian school.

4. Graduate courses are more expensive to offer than undergraduate courses, especially in the technical areas favored by the Navy. While it is difficult to separate graduate costs in the overall cost data from most civilian universities, a trend-line analysis indicates that the cost per graduate-course hour at NPS is much lower than the same cost for any civilian university. If a civilian school were to take over the management of NPS, therefore, there is no basis for believing that it could manage NPS more cost-effectively than the Navy is doing now.

Including these factors in the cost analysis enables a more accurate comparison of NPS against civilian alternatives. Our cost comparison shows that the special benefits of NPS education come at little extra cost. **Specifically, we conclude that**

1. **Measured by the cost per graduate, NPS is the 8th least expensive of the 29 universities considered by CNA.**

2. **Measured by the cost per class hour, NPS is the least expensive of the 29 universities.**

3. **The Navy is unlikely to reduce its graduate education costs by transferring NPS operational control to a civilian institution, unless that institution is willing to subsidize DoN students through its endowment or state tax funding.**

4. **Since the overall costs of graduate education are dominated by officers' salaries and housing costs, our analysis shows that the total costs are about the same, regardless of the provider. Hence, any policy decisions made on graduate education should be made on the basis of benefits to the Navy, in addition to costs.**

The CNA report also criticizes the relatively low rate of using NPS graduates in subsequent assignments in corresponding P-coded subspecialty billets. But CNA's solution, consolidation of subspecialties and curricula, is not based on any cost-benefit analysis, as CNA admits in its report. For some restricted-line and other Navy communities, NPS programs are highly successful in providing officers with the desired skills and utilization rates are high. In these communities, the subspecialty system is working properly and is efficiently coupled to the NPS graduate education system. For some other communities (notably the URL warfare communities at sea) the P-code system is not applicable and does not measure the contributions of graduate education to the performance of the officers. Even without a complete assessment of the value of graduate education, those communities with nominally low P-code utilization are benefiting from the analytic reasoning skills, military-technical familiarization, and other products of NPS graduate education. The P-code utilization rate does not measure these benefits and was never expected to do so. At-sea billets, for example, are rarely P-coded and, yet, officers in these billets do use their graduate education skills. In summary,

the benefits of NPS graduate education extend beyond the subspecialty system. The challenge for the Navy and for NPS is to identify these benefits and incorporate an assessment system that will feed the emerging culture of Navy graduate education.

THE NPS FACULTY CRITIQUE OF CNA'S *A BOTTOM-UP ASSESSMENT OF NAVY FLAGSHIP SCHOOLS*

This is a response prepared by a committee of the NPS faculty to the report *A Bottom-Up Assessment of Navy Flagship Schools* by Linda C. Cavalluzzo and Donald J. Cymrot, Center for Naval Analyses Report CRM 97-24, January 1998. This response was endorsed by the faculty of the Naval Postgraduate School on 2 June 1998.

REVIEW OF CNA REPORT FINDINGS AND RECOMMENDATIONS

The CNA report documented the quality of education at the Navy's flagship schools including the Naval Postgraduate School (NPS). Using a variety of criteria, the report made the following findings in regard to NPS:

- The masters-level program quality is high,
- The labs are excellent (although a maintenance funding 1ssue was identified as a potential problem)
- The programs are approximately 23 months long with refresher and transition activities accounting for 21% of that total,
- The curricula have a highly specific content as a result of meeting the needs of the P-code subspecialty system
- There is a low utilization rate (approximately 37%) of graduates in P-coded billets. There is liberal substitution of related P-codes in filling billets.
- NPS has the highest per-student expenditure relative to other "top-level" schools offering graduate-level technical education.

CNA then went on to make the following recommendations[1] relative to NPS and graduate education:

- Navy leadership should reassess its system of graduate and professional military education and "…in particular the missions of the schools and curricula that fulfill those missions should be reevaluated and better tailored to meet Navy needs…"[2] rather than relying on a subspecialty system focused on shore billets that has poor utilization.
- Navy leadership should consider a curriculum that "…might substitute some technical education with military education. This could take the form of a 'Masters of Science in Military Management and Technology.' Such a degree could include a military core that might cover strategy and operations, and one of several technical tracks that would correspond with the broad technical areas of study that currently form the basis of the subspecialty education."[3]
- Since current utilization rates and substitution patterns suggest that the curricula are overspecified, reduce the level of detail in curricula to allow combination of curricula and to allow competition with civilian schools to offer the resulting streamlined curricula.
- Reduce the time on campus by
  - ~ reducing program lengths through pruning of material,
  - ~ offering refresher courses via distance learning methods,
  - ~ offering provisional acceptances to officers requiring transition to new disciplines (i.e., require officers to complete transition courses before arriving at NPS), and
  - ~ when possible, assigning graduates of USNA directly to NPS.
- Explore the possibility of "…combining NPS and AFIT into a single school at NPS, with the Navy as executive agent."[4]
- Consider "fencing" funding within a fiscal year to avoid funding instabilities.
- Explore the concept of asking for legislative relief to allow the establishment of endowments.

In our continuing self-evaluation process, NPS had already identified some of these issues and had begun working on them. Initiatives were underway in such areas as

- Reducing program length by paring material,
- Combining six curricula into a common Information Sciences, Systems, and Operations curriculum,
- Preparing a curriculum focused on warfare for the warrior (designed to be of special in-

[1] CNA, "A Bottom-Up Assessment ofNavy Flagship Schools," pp. 2-10 and 73-75

[2] CNA, "A Bottom-Up Assessment of Navy Flagship Schools," p. 5

[3] CNA, "A Bottom-Up Assessment ofNavy Flagship Schools," p. 5

[4] CNA, "A Bottom-Up Assessment of Navy Flagship Schools," p. 9

terest to URL officers),
- Developing asynchronous and synchronous distance learning courses, and
- Incorporating Joint Professional Military Education (JPME) and Defense Acquisition Workforce Improvement Act (DA WIA) acquisition course material into appropriate programs.

Our main criticism of the report is the lack of consideration given to the unique benefits of NPS, which make this institution difficult to compare to a civilian university. In addition, we feel that the cost analysis did not incorporate the full spectrum of factors. The following is our assessment of the CNA report.

While NPS may (or may not) appear to be more expensive than civilian alternatives (and our cost analysis shows that NPS is not more expensive), the fundamental question in assessing NPS is whether the costs are justified by the benefits that NPS provides. The following are relevant special features of NPS, which the CNA report ignored in its analysis of NPS and civilian alternatives.

EDUCATIONAL ISSUES

There are several features of NPS that make it different from any other civilian graduate school. These differences are in direct response to Navy needs. The following is a listing of the most important of these benefits.

1. **Military Relevance of Education:** NPS courses and theses are designed to be militarily relevant. The military relevance of an NPS education is the primary reason for the existence of NPS. Many courses are devoted entirely to specialized military topics not available at civilian universities. Some courses at NPS are classified, an option that is not allowed on most civilian-school campuses. Even courses that appear to have counterparts at other universities are taught at NPS with military relevance through the examples and applications.

   NPS curricula are designed to meet the needs of the military communities who sponsor the curricula. NPS is capable of responding rapidly to changing sponsor needs, such as increased technical content in the Special Operations/Low Intensity Conflict (SO/LIC) curricula or the developing curriculum in information technology for the warrior. Civilian universities would not give the Navy the same degree of influence over curriculum design and content.

2. **Special Laboratories and Officer Experience Tours:** NPS' specialized laboratories and facilities provide educational benefits to our officers that would not be available at civilian universities without recreating the facilities there. These include:
   1. Radar/Electronic Warfare Laboratory (containing classified, military systems)
   2. FLTSATCOM satellite telemetry, command system and spacecraft simulator
   3. Point Sur SO SUS underwater acoustic array
   4. Secure Systems Technology Laboratory with CINC-level Global Command and Control System (GCCS) suite and Global Broadcast System (GBS) Receiver
   5. Shipboard Power Systems Laboratory
   6. SCI-classified Signals Processing and Space Systems Laboratory
   7. Fleet Numerical Meteorological and Oceanic Center, the Navy's center for worldwide weather prediction (a tenant activity of NPS)
   8. CIRPAS, an interdisciplinary facility for testing unmanned airborne vehicle (UAV) flight parameters, atmospheric soundings from UAVs and electromagnetic sensors on UAVs
   9. Aircraft Combat Survivability Laboratory
   10. Space Structures Dynamics Laboratory
   11. Turbo-Propulsion Laboratory
   12. Marine Propulsion Laboratory
   13. Secure Wargaming Laboratory

   In some curricula, the faculty and curriculum sponsors take the view that "the real world is the laboratory." For the officers to understand and perform thesis research on real operations, they take extended field trips, called "experience tours," to other military commands and industrial centers. This enriching opportunity would not be available at a civilian university without disruption of the normal academic schedule.

3. Required Masters Thesis: The thesis (required at NPS) provides the officers a chance to practice their newly developed skills on a problem of military interest and relevance (including classified theses up to the SI level). It allows the officers to
   - Define a problem to be studied and resolved in a limited amount of time, under a firm deadline;
   - Integrate the materials studied during their time at NPS in order to bring their new academic knowledge to bear on a practical problem, and;
   - Organize, prepare and deliver written and oral versions of their thesis work.

   Most theses represent a high-quality contribution to the DoD. Faculty members are experts in military-related research and incorporate their thesis students in their research teams. Some

theses have resulted in large savings for the Navy. Others have introduced important new ideas that have had immediate effect on combat-effectiveness. For example, Challenge Athena, which demonstrated a dramatic improvement in the ability of commercial satellites to provide essential, high bandwidth communication to Navy ships, was developed in a (classified) NPS thesis. When assessing NPS' value to the Navy, one should consider the body of valuable research produced by students and faculty.

The thesis is required at NPS because it is considered the keystone of the master's degree program. Thesis students work closely with faculty mentors, focusing on DoD problems, often producing solutions that make substantive contributions to the Navy and other services. NPS tightly integrates the thesis into the educational program. Research-oriented civilian schools focus on doctoral-level work, giving little regard (and sometimes no opportunity) for the master's thesis. At the typical PhD-producing university, advising of masters theses is not considered a significant accomplishment, whereas, at NPS, we consider the quality of MS thesis advising to be one of the most important dimensions of faculty instructional performance.

4. **Dealing with Needs of the Adult, Mid-Career Learners After Selection Based on Navy Requirements:** Many officers do not have the necessary undergraduate preparation for graduate study in their assigned field. Due to the selection emphasis on military performance and the skills needed by the Navy, in addition to academic performance, the admissions requirements are significantly different at NPS than at civilian universities. Before entry, NPS officers are not required to be exactly matched into their graduate fields or to provide evidence of high-level academic achievement (e.g., high undergraduate grades, recommendations of instructors, and scores on the Graduate Record Exams). NPS is extremely adept at efficiently transitioning these officers to new fields if it is in the interest of the Navy. (This is particularly important to the military since its closed-pipe personnel system precludes mid-career accessions in areas of Navy need). No civilian university routinely faces this requirement to transition its students to new fields or can deal with it as efficiently and effectively as NPS.

   Similarly, NPS does an efficient and effective job of refreshing officers who have been away from the academic world for a while. Mid-career, adult learners, no matter how bright, need some assistance in getting back into the academic mode. Meeting NPS officers' transition and refresher needs adds time that civilian masters programs do not need to spend. The CNA report recommends the use of distance learning (DL) and computer-based instruction to reduce the length of NPS programs. NPS already delivers some graduate instruction by video-teleconferencing DL and is actively pursuing asynchronous network-based learning. As educational innovators, the NPS faculty welcomes the opportunity to develop these courses in support of the officers' needs. However, past experience with correspondence courses and anecdotal evidence from our students suggest that little time is available to study during duty assignments. We propose that pilot studies be undertaken to develop some courses in order to prove the concept before any large-scale implementation.

   Similarly, CNA recommends that officers be given provisional acceptance to NPS, subject to their acquiring the undergraduate background needed for their program before arriving at NPS. This suggestion is a great disincentive for officers to transition into programs of Navy needs. Few would transition into the engineering and science fields and, for those few, the time required for the preparation would be prohibitive. For example, about eight undergraduate engineering courses and an engineering design project would be required for a non-engineering major to be prepared for admission into a graduate engineering program. The result of this recommendation would be for officers to seek admission only to programs with minimal entrance requirements, i.e., programs outside of the science, engineering, and technical areas of critical Navy need.

5. **Calendar and OPTEMPO**: NPS operates 48 weeks a year, compared with civilian universities which offer full programs for only 32 weeks per year (semester system) or 33 weeks per year (quarter system). Courses at NPS are scheduled in response to curricular requirements, not department preferences, improving curricula efficiency.

   In addition, while at NPS, officers take around 16 credit-hours per quarter or 64 credit-hours per year, an aggressive academic load that necessitates having more faculty than a civilian school (where most faculty are off during the summer).

   NPS respects the officer's scheduled completion date. Programs at civilian universities with thesis options have unpredictable duration. Students take as long as they need to finish and are not hastened by the faculty, in contrast to NPS, where

the faculty understand the career consequences of a student not finishing on time.

6. **Military Infrastructure:** NPS provides a complete military infrastructure that supports the military and professional aspects of the officer's career while at NPS. The officers are still immersed in a military environment and are not "away" from their parent service. The presence of fellow officers from other services enriches the experience and makes possible joint military education. International officer-students also add a unique professional dimension, especially since a large percentage of them will ultimately become high-level leaders of their nations' militaries. The experience with officers from other nations enhances future performance in combined operations and exercises. In addition, the presence of military instructors at NPS provides an additional dimension of military presence. It is noted that this benefit of maintaining military connectivity does not come without costs, however. NPS maintains a military line of command involving a Dean of Students/Director of Programs office, headed by an 06, and a set of Curriculum Officers with associated support personnel. This line of command would not exist at civilian universities.

Each of these educational benefits has evolved over time at NPS in response to Navy needs. They collectively establish NPS as a unique educational institution that is closely coupled to the Navy's requirements. Establishment of graduate education programs at civilian institutions will require study of whether these attributes should be retained or not, since civilian programs will have to be reorganized to provide them. Any efforts to compete NPS against civilian institutions will have to clearly specify the features desired.

UTILIZATION ISSUES

The CNA report finds that the P-code subspecialty system results in increased curriculum specificity.[5] In tum, this specificity is assumed to contribute to the "high" cost of an NPS education. The report concludes that, with low P-code utilization rates, the "high" education costs due to this perceived specificity are not justified. Thus, the CNA report recommends that the Navy move toward less specific curriculum requirements to allow streamlining of curricula; the elimination of small, inefficient curricula; competition with civilian universities to offer the resulting, general programs; and the development of a more generic program leading to a degree such as a "Master of Science in Military Management and Technology."[6]

In contrast, the analysis provided in the remainder of this report indicates that NPS provides cost-effective graduate education including curriculum specificity. The extent to which curriculum specificity increases program duration is unclear; thus, the additional costs of maintaining specificity are not quantified in the CNA report.

Furthermore, the benefits of a P-code driven educational program have not been assessed in the CNA report. The P-code-driven curriculum model currently serves a number of shore-based (and some fleet-based) communities exceedingly well; these communities value graduate education and have high fill and utilization rates. Loss of these curricula would severely impact the effectiveness of these communities.

Since the P-code system was devised to support only the shore-based activities of the Navy, it is not clear that the utilization rates and other such measures capture the true impact of graduate education. In the absence of any assessment instruments, it is particularly difficult to capture the impact of graduate education on the URL officers who have attended NPS. Numerous flag visitors have attested that, while they have not recently used the specific disciplinary information received at NPS, they have definitely benefited from the resultant critical thinking skills and problem-analysis capabilities throughout their career.

We caution against substituting a generic program leading to a degree such as a "Master of Science in Military Management and Technology" for the traditional technical curricula. Such a generic program, while perhaps appropriate for some warfighters, runs counter to the trend of increasing sophistication of systems and the skills needed to utilize them fully. The Navy would be best served by having a significant fraction of officers familiar with the details of the technology. Navy leaders should consider the advantages of having a "dual-track" graduate education system for both those who use technology and those who foster its development and insertion in support of warfighting needs.

[5] CNA, "A Bottom-Up Assessment ofNavy Flagship Schools," pp. 60–63.

[6] CNA, "A Bottom-Up Assessment of Navy Flagship Schools," p. 5.

COST COMPETITION

The CNA report recommended that graduate degree programs for Naval officers be competed from multiple providers including NPS to establish a market mechanism for achieving cost-effective delivery.[7] However, such a market mechanism requires that the requirements of program offerings are clearly stated and held constant. The requirements to be included in a request for proposals should include:

- Requiring that officers complete a military-relevant thesis
- Maintaining a military command infrastructure
- Offering classified courses and opportunities for classified thesis research
- Providing specialized educational laboratories devoted to military hardware and computer systems
- Providing military-relevant course material
- Committing to predetermined officer graduation dates
- Providing each officer with at least 16 contact hours per week, including in the summer
- Letting admissions be determined predominately on military performance, in addition to academic performance, and letting admissions functions be shared with the Navy
- Providing refresher and transition courses and any other requirements, as necessary.

COST-EFFECTIVENESS OF NPS IN DELIVERING GRADUATE EDUCATION

The CNA report uses data from the Integrated Postsecondary Education Data System (IPEDS) to compare the costs of NPS graduate education and the cost of education at 28 top ranked civilian universities offering engineering Ph.D. programs. In their comparative cost analysis, CNA concludes "… that in 1993-1994 NPS' expenditures were in the top-quartile for total and educational expenditures per student."[8] They found that NPS is the most expensive school when the comparison considered only tuition costs for the civilian schools. This leads CNA to recommend strategies to reduce the "high" costs of an NPS education and later to suggest that the Navy consider greater use of civilian schools. In particular, CNA recommended that:

> "… Navy schools be invited to compete along with civilian schools for contracts to furnish educational services that meet Navy needs. Educational contracts need not go to the lowest bidder, but would presumably go to the most cost-effective provider. Faced with competition, Navy schools would be encouraged to seek out their own opportunities for efficiency gains, eliminating the need to benchmark spending. Even if the Navy makes no changes in its choice of providers, we would expect competition to improve efficiency."[9]

Competition and expanded use of civilian schools can take on three forms: transferring control (and, perhaps, ownership) of NPS to a civilian institution, transferring all officers in particular curricula to another specific civilian-sector curricula, and transferring individual or small groups of officers to any of several approved civilian programs.

The cost-effectiveness analysis in the remainder of this report considers the first and third of these options. The cost of the second option should be between the two considered. More specifically, the analysis is designed to answer two questions:

- *Can DoN expect to reduce its graduate education costs by transferring NPS ownership and operational control to a civilian-sector university?*
- *Can DoN reduce its graduate education costs by sending officers to civilian institutions rather than NPS?*

To answer the first question, this analysis compares the cost of operating NPS to the total cost of graduate education at civilian institutions, after normalizing for several factors. These factors are: student salaries and benefits, transition and refresher courses, course loads and contact hours, and lower undergraduate costs (the results are summarized in Figures 1 and 2 below). The second question is addressed by comparing the cost of operating NPS to the cost of tuition at civilian institutions. Costs in this comparison are normalized for student salaries and benefits, transition and refresher courses, and course loads and contact hours (these results are summarized in Figure 3 below).

The analysis to follow shows that, after normalizing costs across institutions, the Navy is unlikely to

[7] CNA, "A Bottom-Up Assessment ofNavy Flagship Schools," pp. 71.

[8] CNA, "A Bottom-Up Assessment of Navy Flagship Schools," page 70.

[9] CNA, "A Bottom-Up Assessment ofNavy Flagship Schools," pp. 7.

reduce its graduate education costs by transferring NPS operational control and ownership to a civilian institution, unless that institution is willing to subsidize DoN students through its endowment or state tax funding. Similarly, cost savings from sending NPS officers to civilian universities are limited and must be balanced against NPS' unique benefits as described earlier in this report. As a result, a competitive contracting process is unlikely to find a more cost-effective provider than NPS. The detailed analysis supporting these conclusions follows.

An appropriate comparison between NPS and civilian-sector alternatives should be structured as a "cost-effectiveness" analysis. A cost-effectiveness analysis is appropriate when it is impractical to consider the dollar value of the benefits provided by alternatives under consideration. Given the difficulty in identifying the dollar value of an NPS or civilian-sector education, a cost-effectiveness analysis is appropriate. This approach is the standard for policy and program analysis; it is also mandated by OMB Circular A-94, *Guidelines and Discount Rates for Cost-Benefit Analysis of Federal Programs.* This Circular applies to all agencies of the Executive Branch of the federal government, including analyses conducted within or for the Department of the Navy (DoN) or the Department of Defense (DoD).

More detailed guidance for cost-effectiveness analyses is found in many references.[10] The cost analysis portion of CNA's report is most appropriately interpreted as a "fixed effectiveness" cost-effectiveness analysis.[11] This approach compares the costs of alternitive means to provide a fixed benefit; the least expensive approach is the most cost-effective. The key to using this approach is to ensure that the assumed benefits are as consistent as possible across the alternatives.

While the CNA analysis provides a useful first step, it currently falls short of a comprehensive cost-effectiveness analysis. As outlined earlier in this critique, there are significant educational differences between NPS and civilian graduate programs that are not accounted for in CNA's analysis. Many of these have cost impacts that are easily estimated, particularly the refresher and transition courses and the extra academic loads taken by NPS students. The cost impacts of these factors will be incorporated here, using data from CNA and N81.[12]

There are several differences between NPS and civilian-sector graduate programs that bias any comparisons based on IPEDS data, including CNA's analysis. These differences include:

1. **Student Salaries and Benefits** The IPEDS data and the CNA analysis consider only the cost of education. Full-time military graduate students receive full salary and benefits while attending school. The total cost of a Master's degree includes both salary and benefits payments and educational expenses. Salary and housing costs can create significant cost differences across institutions if graduate programs differ in duration.

2. **Transition and Refresher Courses** NPS offers transition and refresher courses for officers entering graduate programs that differ from their undergraduate degrees and to compensate for any lags between undergraduate and graduate enrollment; civilian programs include only degree-related graduate education, SO students must be fully prepared before entering the program.

3. **Course Loads and Contact Hours (Calendar and OPTEMPO)** NPS requires officers both to carry a heavier class load each quarter and to attend classes more weeks per year than do civilian-sector universities. Officers are exposed to more material per time period at NPS than at civilian-sector universities.

4. **Lower Undergraduate Education Costs (Cross-Subsidies)** NPS has no undergraduate program, while all civilian universities included in CNA's comparison offer both undergraduate and graduate degrees. Graduate education is widely acknowledged to be more expensive than undergraduate education, artificially lowering the cited civilian-sector costs relative to NPS.

5. **Endowments and State Funding** Civilian-sector universities have endowments or state funding that cover a significant portion of graduate school costs; tuition covers a relatively small portion of total costs.

We now consider a detailed discussion of each of the

[10] For example, Policy Analysis: Concepts and Practice, by David L. Weimer and Aidan R. Vining, Prentice Hall, 1989.

[11] Weimer and Vining, page 221.

[12] "Memorandum for the Deputy Chief of Naval Operations (Resources, Warfare Requirements and Assessments)," Ser N8113U639949, 29 March 1993.

five cost factors.

1. Student Salaries and Benefits

CNA reports that the average NPS student spends 22.8 months in residence at NPS. This compares to an average program of 24 months for Navy URL officers enrolled in graduate programs at civilian institutions (called "civins") in 1994.[13] If NPS resident and civins programs are of different durations, any cost comparison must include the opportunity cost of the officers' time. This is a significant portion of the total cost of graduate education for Navy and Marine Corps officers. N81 estimated the cost of salary, benefits, and housing (referred to as MPN costs) for both NPS-resident and civins students.[14] In particular, N81 estimated that in FY1994 the annual MPN cost per NPS-resident officer was $63,300, compared with the annual MPN cost of $72,300 per officer-student at civilian institutions. The higher MPN cost for the civins officer-students reflects differences in housing costs. NPS-resident officers predominantly live in base housing; DoN civins officer-students live in more expensive off-base housing. (Note that NPS MPN costs include base-housing maintenance.)

Using N81's estimated MPN costs, CNA's IPEDS educational cost data, and the average program length for NPS and civins students, we can calculate the present value of the total cost of a master's degree. In this calculation, second year costs are discounted to reflect the time value of money. (Present value calculations reflect the direction in OMB circular A-94 for analyses involving multi-period decisions.) The calculations here use a 2.1% real discount rate; this was the short-term real discount rate mandated in 1994 by Appendix C to OMB Circular A-94. (Appendix C is updated annually, but the 1994 discount rate was used in this analysis for consistency with the 1994 IPEDS cost data.[15]) In these calculations, the total educational expenditures in dollars per FTE are assumed to remain constant in real terms (increase in nominal terms at the rate of inflation) during the officer's graduate program.

Incorporating program duration and MPN costs reduces the total cost of an NPS graduate degree relative to civilian-sector universities. In particular, NPS' cost of a graduate degree is $231,024; the mos expensive master's degree from the schools on CNA's list is $387,947 for the California Institute of Technology (Cal Tech), the cheapest degree is $175,091 for the University of Maryland-College Park. The weighted average cost of a master's degree is $210,112. This adjustment moves NPS from the fifth to the ninth most expensive school on CNA's list. This reflects both the civins program's longer duration and the higher housing costs. The cumulative effect of this and later adjustments is shown in Figure 1.

2. Transition and Refresher Courses

NPS provides officers transition and refresher courses before they begin their graduate education at NPS. CNA estimates that this accounts for 21% of the time the average officer spends at NPS. According to CNA, the average NPS residency is 22.8 months; by inference from CNA's data, 18 months (79%) is spent in graduate courses and 4.8 months (21%) is spent in transition (20%) and refresher (1%) courses.[16]

Transition and refresher courses are not graduate requirements at NPS. In contrast, these courses reflect Navy policy that selects officers for graduate work based on criteria beyond their undergraduate background and academic performance. If the Navy chose to adopt traditional civilian-sector admissions standards, these courses could be eliminated from NPS' curriculum. On the other hand, if NPS officers were transferred to equivalent civilian-sector programs, these costs would be incurred at the civilian universities.

Transition and refresher course costs are not included in the civilian graduate program costs as measured in the IPEDS database. To include these costs as part of NPS' graduate degree program inappropriately biases the analysis against NPS. To compare NPS and civilian graduate program costs more accurately, transition and refresher course costs should be eliminated from NPS' cost base, just as they are from the civilian alternative.

To make this adjustment, the average residency at NPS can be reduced by 21%, to reflect CNA' s estimate of the purely graduate coursework at NPS. As stated, this reduces NPS average residency to 18 months and NPS' graduate program costs to

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[13] Data are from the Manager of Navy CIVINS programs, Naval Postgraduate School, Monterey CA.

[14] "Memorandum for the Deputy Chief ofNaval Operations (Resources, Warfare Requirements and Assessments)," SerN81/3U639949, 29 March 1993).

[15] OMB Circular A-94, "Guidelines and Discount Rates for Cost-Benefit Analysis of Federal Programs: Appendix C," revised January 1998.

[16] CNA, "A Bottom-Up Assessment of Navy Flagship Schools," page 66.

$182,919. No adjustment is required for the civilian-sector IPEDS cost data. Eliminating transition and refresher course costs from NPS' cost base lowers NPS from the ninth most expensive program to the 22nd most expensive program. *NPS now becomes the eighth least expensive program.*

3. Course Loads and Contact Hours (Calendar and OPTEMPO)

In addition to the preceding differences, a comprehensive cost-effectiveness analysis should correct for differences in program content across alternative institutions. NPS programs satisfy both traditional academic degree and Navy P-code subspecialty requirements. With these dual requirements, NPS programs are likely to include program content beyond that found in civilian institutions. Ideally, a cost-effectiveness analysis would compare NPS program content to the content of corresponding civilian programs. However, detailed program content data is not readily available. In fact, CNA states that they did not consider specific degree programs in their analysis.

There are two possible measures to capture differences in program content, program credit hours and program class hours. Credit hours and class hours are inputs to the education process. However, each can serve as a proxy for program content if this input is similar across institutions. In other words, this comparison is appropriate if there is consistency across the programs in the rate at which faculty can deliver and students can absorb class material. There is no reason to believe that NPS faculty and students are less able to deliver and absorb material than their civilian counterparts.

NPS officers carry a heavier class load per quarter and attend classes more weeks per year than civilian-sector universities. In particular, NPS officers typically have 16 contact hours per week and attend classes 48 weeks per year. As a result, the typical NPS officer receives credit for 64 contact hours per year and attends 768 hours of instruction per year. In contrast, civilian-sector graduate students typically attend classes 13 hours per week for 32 weeks during the standard academic year. During the summer, some students attend classes seven hours per week for ten weeks. Thus, the typical civilian-sector student is unlikely to receive more than approximately 486 hours of instruction per year, including summer classes.

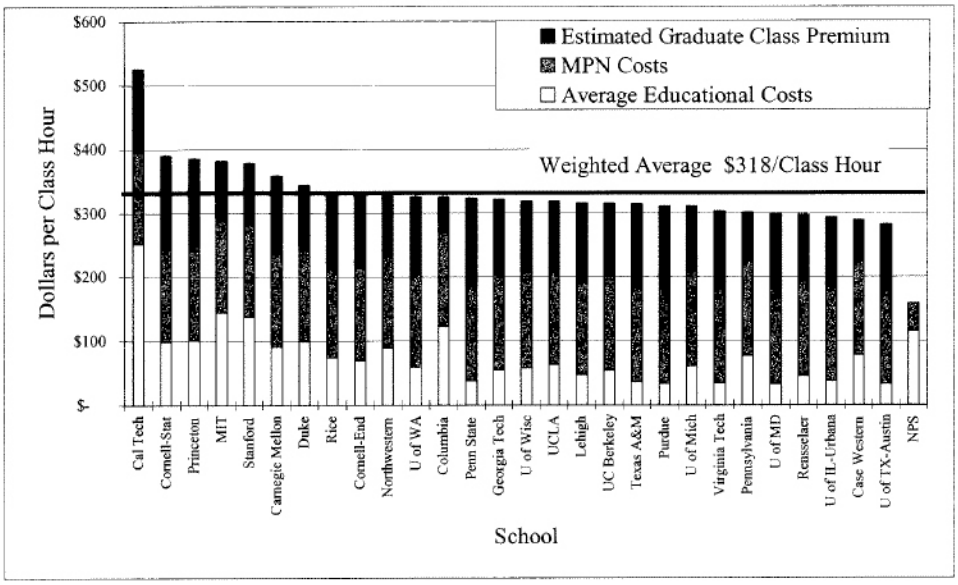
This analysis uses class hours as a proxy for program content. Credit hours have different implications for quarter and semester system programs and cost per credit hour comparisons would not correct for the extra weeks of instruction in the typical NPS academic year. In particular, NPS officers receive 1,152 hours of graduate instruction in the 18 months after they complete their refresher and transition courses. In contrast, civilian institutions provide 972 hours of graduate instruction in their typical 24-month graduate programs. These values are used to convert total graduate program costs to graduate program costs per hour of instruction.

Figure 1 shows the results of combining the adjustments for officer salaries and housing, the need for transition and refresher courses, the forty-eight week NPS school year, and the increased academic load at NPS. (The "expected graduate class premium" assumes that graduate education is twice as expensive as undergraduate education as explained in section 4 that follows.) Even without this graduate premium, NPS has the lowest graduate program costs per hour of instruction among the universities in CNA'S list. NPS' graduate education costs are $159 per class hour; civilian-sector costs range from $399 per class hour (Cal Tech) to $180 per class hour (University of Maryland-College Park). The weighted civilian-sector average is $215 per class hour.

It is interesting to note that the same result pertains if this adjustment is applied to the NPS program including transition and refresher courses. Including transition and refresher courses would increase both class hours and total program costs by the same percentage. Cost per class hour would be unaffected. Nevertheless, both this and the previous adjustment portray important considerations. This adjustment indicates that NPS offers a more intensive instructional program than typical civilian universities. The prior adjustment indicates that NPS officers typically graduate more quickly than students in equivalent civilian graduate programs.

These two adjustments help explain the seeming contradiction between CNA's results and the results reported here. NPS' intensive academic program requires a similarly intensive use of faculty, staff, facilities and equipment. This will increase NPS' annual costs per officer, as reported by CNA. A higher annual cost per officer is the disadvantage of intensive education. However, a more intensive educational program also exposes officers to more material per unit time, allows them to graduate more quickly, and reduces the associated officer salary and benefit costs. These are benefits of the more intensive education. CNA's analysis only measures the disadvantages of NPS' relatively intensive education; this analysis incorporates the advantages. The results reported here indicate that the advantages outweigh the disadvantages.

Figure 1
Comparative NPS Graduate Military Education Costs
Annual costs per student,[1] with adjustments for students' salary/benefits,[2] program duration,[3] transition and refresher courses,[4] course load and contact hours.[5]



[1]Student population is defined as full time equivalent students at NPS; fall enrollment elsewhere.
[2]Military Salary and benefits is $63,300/year at NPS; $72,300 elsewhere, reflecting higher off-base housing costs. Program duration is 24 months at civilian universities.
[3]NPS program duration is 22.8 months, including transition and refresher courses.
[4]NPS *graduate* program duration is 18 months, excluding transition and refresher courses.
[5]Civilian universities include 972 class hours (a 24 month program with 13 class hours/week for 32 weeks during the normal academic year, plus 7 class hours/week for 10 weeks during the summer). NPS program includes 1152 class hours (an 18 month program with 16 class hours/week, 48 weeks/year). The NPS cost per class hour would be the same for the graduate program plus transition and refresher courses (class hours and program costs both increase proportionally).

4. Lower Undergraduate Education Costs (Cross-Subsidies)

It is generally acknowledged that graduate education is more expensive than undergraduate education. Larger undergraduate class size and instruction by graduate teaching assistants are at least two of the reasons to expect this cost difference. Graduate instruction and research also require more expensive equipment and specialized laboratories, especially if every student is required to complete a master's thesis. This is particularly significant for technical graduate programs.

Unfortunately, the magnitude of this difference is difficult to estimate. One analysis found that graduate education was two to three times as expensive as undergraduate education in studies conducted by three states: Washington, Florida and Illinois.[17] However, the report noted that each state used a different method to collect data and allocate costs across programs. While this may indicate that cost comparisons are relatively insensitive to differences in data collection and cost allocation, the study's authors cautioned against extrapolating these results to other states.

The CNA report uses IPEDS data that combine undergraduate and graduate costs for all schools except NPS. The 28 comparison schools include a graduate student body that ranges from 15% to 66% of the total student body; the weighted average graduate population is 35% of the student body. Only a portion of these graduate students are in engineering and other equipment- and laboratory-intensive programs. NPS is 100% graduate students, with a relatively high percentage of students in technical and engineering graduate programs. This biases the comparison against NPS.

There are at least two ways to account for this inconsistency. One approach uses the IPEDS data to impute a cost per graduate student. CNA provides data on total costs, total full time equivalent (FTE)

[17] Peter D. Syverson and Moira J. Maguire, "Estimating Institutional Costs of Graduate Education: Reports from Three States Demonstrate Promise, Pitfalls of Cost Studies," Council of Graduate Schools, 1997.

students (measured in this data by Fall enrollments), and percent graduate student body. Assuming that graduate school costs are two to three times as high as undergraduate student costs, this data can be used to impute a cost per graduate student for each of the civilian-sector universities. This will increase the real resource costs of the civilian universities, while not affecting NPS costs per graduate credit hour. The results of this adjustment, assuming that graduate costs are twice as high as undergraduate costs, are reported as the "expected graduate class premium" bars in Figure 1. As expected, this adjustment increases NPS' cost advantage per graduate class hour relative to civilian institutions. In particular, NPS' graduate education cost is $159 per class hour, as found above; civilian-sector costs with graduate premiums range from $525 per class hour at Cal Tech to $282 per class hour at the University of Texas-Austin. The weighted civilian-sector average costs with the graduate premium is $318 per class hour.

An alternative correction is to plot the cost per student against the percentage of graduate students for the 28 comparison schools. A trend line can be estimated from this data that projects the average cost per student as a function of the graduate population. The cost per student at NPS can be compared to this trend line to determine if NPS is above or below this trend. This correction is illustrated in Figure 2. Two trend lines have been included for reference: a linear trend line (dashed) and a logarithmic trend line (solid). *In either case, NPS is well below the trend line, indicating that NPS' total cost per student is below the average that would be expected at civilian-sector schools with 100% graduate students.*

5. Endowments and State Funding

The IPEDS data reported by CNA indicate that average tuition payments in the civilian-sector are only 27.5% of the total cost of education. The remainder is covered by endowments and state tax funding. NPS has no endowment and is currently restricted from developing one. Thus, the Navy must pay 100% of the education costs at NPS. NPS faces an inherent cost disadvantage in providing graduate education for a budgetary cost that competes with civilian-sector tuition.

The Navy is concerned about the budgetary implications of its military education decisions. CNA reports that NPS has a significantly higher annual "tuition" cost than all other civilian-sector universities. CNA also reports that NPS' annual "tuition" cost is $59,488; tuition costs for the civilian universities in CNA's analysis range from a high of $20,014 for the Massachusetts Institute of Technology to a low of

Figure 2
Projected Civilian Graduate Education Costs per Year
Uses IPEDS data on total education costs and percent graduate student population, reported by CNA, to project education costs as the percent graduate student population increases.

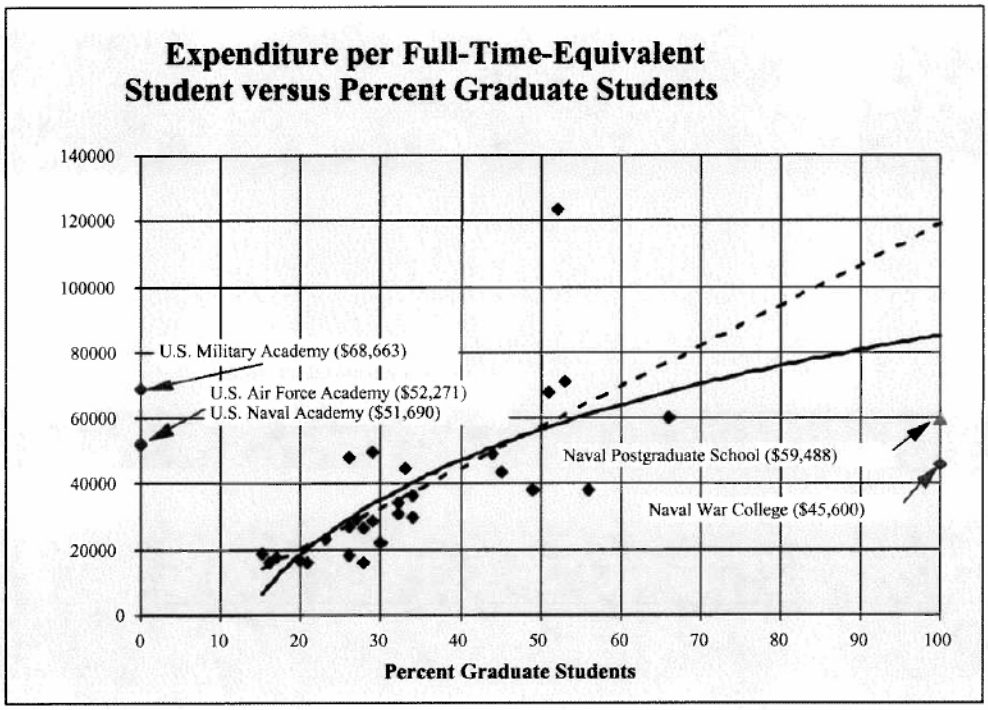
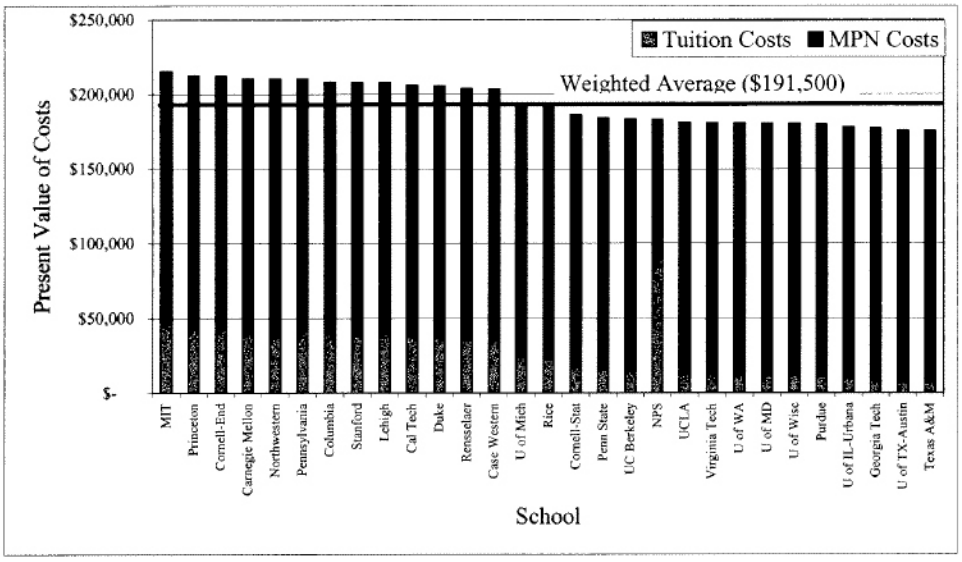


Figure 3
Present Value of Total Program Costs for 1,152 Graduate Class Hours: Tuition Expense and MPN

Total graduate program costs per student, from IPEDS data reported by CNA, adjusted for program duration and students' salary/benefits, assuming program lengths of 1,152 class hours.



$2,805 for Texas A&M University.

Again, this cost comparison does not consider either the cost of officers' MPN costs or NPS' more intensive educational program. These factors reduce NPS' cost disadvantages in two ways: NPS' intensive instructional program reduces residency requirements at NPS relative to civins for a given class hour requirement, and NPS has lower MPN costs (due to lower housing costs). To account for these differences, the IPEDS data in the CNA report can be modified to include MPN costs and to equate class hours across NPS and civilian universities. To equate class hours, either the NPS program can be shortened to 972 graduate class hours, the typical civilian program requirement, or the civilian programs can be extended to 1,152 class hours, the typical NPS program. The results of the latter modification are shown in Figure 3.

Figure 3 shows that NPS total program costs, including MPN, are the 19th lowest among the 29 schools considered, even when civilian-sector schools are valued at their tuition costs. In particular, the present value of NPS' total cost per officer for a 1,152 class-hour program is $182,900, compared to $215,500 for MIT (the most expensive program by this measurement), and $175,300 for Texas A&M (the least expensive program by this measurement). The present value of the weighted average total cost per student is $191,500. For a 972 class-hour program, the present value of NPS' total cost per officer is $154,700, compared to $182,700 for MIT and $148,700 for Texas A&M; the present value of the weighted average total cost per student is $162,400. *Thus, NPS remains cost competitive with civilian-sector schools even if the civilian program costs are valued only at the tuition values plus MPN.*

Figure 3 also shows that MPN costs dominate the tuition costs in calculating the total cost of a graduate degree. NPS remains cost competitive with tuition costs at civilian schools, despite their endowment and state tax financing subsidies, because NPS has lower MPN costs. Lower MPN costs reflect the more intensive educational program and lower housing costs at NPS. This distinction is illustrated in Figure 3. Figure 3 breaks the present value of total costs per officer, for a 1,152-hour program into its tuition and MPN cost components. *From Figure 3, it is obvious that NPS compensates for higher "tuition" costs with lower MPN costs. CNA 's cost comparison captures only the tuition cost differences; this analysis incorporates the MPN cost implications.*

6. Cost Analysis Summary

The IPEDS data reported by CNA indicate that NPS has higher annual costs per FTE than comparable civilian-sector schools. However, this comparison does not indicate that civilian universities could more cost-effectively provide the services NPS offers. In particular, NPS and civilian schools can not be compared on the basis on the IPEDS data; NPS' unique mission and officer body is not comparable to civilian universities without further adjustments.

Preliminary adjustments were described and incorporated m this analysis. In particular, the IPEDS and NPS education costs were modified to:

- Reflect the total cost of producing a graduate, including MPN;
- Separate the cost of NPS' graduate courses from transition and refresher courses;
- Account for NPS' heavier class load and additional weeks of instruction;
- Highlight the fact that NPS offers only graduate education while civilian universities also provide undergraduate education, which is less expensive.

After making these adjustments, it appears that NPS provides cost-effective graduate education compared to the civilian universities included in CNA's report. Figure 1 demonstrates that NPS' costs are lower than comparable costs at civilian universities. This comparison is based on total graduate program costs per class hour. Per OMB circular A-94, this comparison measures the real cost of military graduate education, as is appropriate in evaluating public sector programs. This comparison indicates that DoN should not expect significant education cost savings by transferring NPS ownership and oversight to a civilian university; education costs would likely increase.

Figure 3 demonstrates that NPS remains cost competitive with civilian-sector universities when evaluated on tuition costs. This reflects NPS' intensive academic program and lower MPN costs. This indicates that the potential total cost savings from sending Navy and Marine Corps officers to civilian universities is limited; in many cases the total costs are higher at civilian universities after correcting for class hours. Of course, any cost savings must be balanced against benefits of NPS as described earlier in this critique.

The results of this cost analysis are consistent with one of CNA' s findings. CNA reports that NPS accreditation reviews commented on both the heavy student and faculty workloads. This reflects NPS' intensive academic program. The cost-effectiveness implications of heavy student and faculty workloads and the resulting intensive academic program are not captured by the IPEDS annual education cost data. The adjustments incorporated here account for these factors and more accurately measure cost-effectiveness.

CNA concludes that there are two major factors accounting for the "high" costs of an NPS education: program duration and specificity of the curriculum.[18] The analysis presented here counters these fmdings. Program duration is largely driven by the Navy's policy of both delaying entry into graduate education after officers complete their undergraduate degrees and requiring some officers to change their course of study from their undergraduate degrees to meet Navy needs. This policy has both costs and benefits. This policy is vital to allow the Navy to meet its specialty requirements despite its closed-pipe personnel system that precludes mid-career accessions in areas of Navy need. However, it increases education costs and program length, whether officers attend NPS or civilian universities. If Navy policy requires that officers attend transition and refresher courses, the analysis provided here indicates that NPS delivers these courses more cost-effectively than the civilian universities highlighted by CNA. Transferring officers to resident civilian university programs is not likely to reduce the real cost of the transition and refresher courses. In evaluating NPS' cost-effectiveness it is important to distinguish between the costs NPS controls and the cost implications of the Navy's graduate military education policy.

There may also be effective alternatives for providing transition and refresher courses. However, the costs and benefits and cost-effectiveness of the current policy and its alternatives (including the opportunity cost of the officers' time) should be systematically evaluated before recommending dramatic changes to the current system.

The analysis presented here also has implications for CNA's P-code utilization discussion. CNA concludes that the P-code system drives curriculum specificity. In tum, this contributes to the "high" cost of an NPS education. With low P-code utilization rates, the resulting high education costs might not be justified. Thus, CNA recommends moving toward a program leading to a generic degree in military management and technology. We feel that such generic approach, with option tracks that allow some specialization, might be appropriate for the URL officer; however, this approach would not meet the Navy's needs for technical subspecialists in the restricted line or specialty communities.

In contrast, the analysis provided here indicates that NPS provides cost-effective graduate education despite curriculum specificity. The extent to which curriculum specificity increases program duration through transition and refresher course requirements is unclear and has not been analyzed; thus,

[18] CNA, "A Bottom-Up Assessment of Navy Flagship Schools," page 72.

the costs of maintaining specificity are unknown. Furthermore, the benefits of NPS' P-code driven educational program has not been assessed. Benefits include the value of P-code driven curriculum versus a more generic curriculum for the restricted and unrestricted line officers that fill exactly matching and closely related P-coded billets. If the value of exact and close matches is significant, and the costs of specificity low, NPS' current curriculum structure may be appropriate. Similarly, it is important to evaluate the benefits of a P-code driven curriculum against the benefits of more generic curriculum for officers who never fill exact or closely matching billets. The additional benefits of a generic curriculum on general officer performance may be significant; or they may be limited. These issues should be assessed in a comprehensive cost-benefit analysis before concluding that the Navy should restructure NPS' curricula because of the current P-code utilization rates. There may well be a convincing argument that the 21st century Navy needs technically educated officers. One should think carefully before mandating that all officers-students should take management degrees.

CRITIQUE SUMMARY

In 1909, the Navy decided to make a strategic investment in developing its junior officers. It put in place an enlightened program that allowed its brightest officers, with proven military leadership skills, to recapitalize their intellectual skills at a critical point in their career paths. The leadership decided at that time that civilian universities could not provide exactly the desired program, so they established the predecessor of NPS to provide the environment and the programs that would produce the desired goals. The resulting program can be considered a model for providing mid-career, professional, technical education.

The present curricula and operation of NPS have evolved over time in response to Navy needs. Specifically, NPS programs provide specific benefits to the Navy beyond traditional graduate-degree programs. These benefits include the military relevance of the programs, the specialized facilities that extend this military relevance, the theses and studies that support DoD and the Navy, an admissions process focused on military performance of the officers rather than academic performance, an efficient refresher and transition system that meets the Navy's mid-career professional development of the officer corps in areas of technical need, an intense academic schedule that fully absorbs the officers' energies, and a military infrastructure that keeps the officers fully involved in their profession.

The P-code system was established to meet the shore-based needs of the Navy; it mostly ignores the benefits that graduate education provides to billets at sea. Anecdotal evidence indicates that the benefits of graduate education (e.g., problem analysis, solution synthesis, critical thinking skills, time management) carry over into non-P-coded billets and have special impact at flag rank. The challenge is to devise an assessment system that measures the impact of these skills in order to make critical decisions about benefits and costs of graduate education. The Navy's graduate education must then meet the needs of both the warfighter and the subspecialist; a generic management and technology program cannot provide the level of content required by the subspecialists and some warfighters.

Contrary to the CNA's analysis, our cost study indicates that NPS is highly cost efficient when the following factors are included: (1) the officers' salary and benefits (including housing), (2) the costs of transition and refresher courses that have been established to meet the Navy's policies of delaying graduate study until some on-the-job experience has been obtained and to transition officers into technical areas of study to meet Navy needs, (3) the higher number of hours that officers are in contact with the faculty at NPS, and (4) the extra expense of technical graduate education compared to schools that can subsidize their graduate programs with their undergraduate enrollments.

The Committee cautions that any attempt to have NPS compete for programs against civilian institutions must decide in advance what non-degree benefits will be provided. Must the institutions provide refresher and transition support? Must the institutions accept all officers that the Navy sends or will they apply their existing graduate-program admission standards? Must a thesis be part of the program? These and other requirements need to be addressed in order to fairly compete for provision of the programs.

CNA made also recommendations that the Navy explore the possibility of merging NPS and AFIT, and explore legislative relief to allow the establishment of endowments. These policy revision are outside of the purview of the NPS faculty. The Committee has no objections to the exploration of these issues. CNA also encourages consideration of fencing funding within a fiscal year in order to remove funding instabilities. The Committee welcomes this idea since it would add stability to annual funding cycle.

The Committee believes that the primary question that should have been addressed in any outside study of NPS is whether NPS has accomplished its

mission. Does NPS contribute to the combat-effectiveness of the Navy? While we answer this question strongly affirmative, the CNA study would have been an opportune time for an independent answer. We believe the issues raised in our report are relevant if this inquiry is made.

In closing, we quote Vice Admiral John Scott Redd, Director for Strategic Plans and Policy of the Joint Staff, who earned an M.S. in Operations Research with distinction from NPS in 1978. During a recent graduation speech at NPS, VADM Redd mentioned that "he had turned in his numbers license long ago," indicating that he was no longer a practicing operations analyst. Nevertheless, the following remarks show that he derives profound and lasting value from his NPS education whether or not he is serving in a matching P-coded billet.

> "The purpose of this letter is to put in writing my feelings on the value of the education I received at the Naval Postgraduate School and its impact on my career. The two years my family and I spent in Monterey were among the best in our lives and the education I acquired there has proven priceless. I have experienced first-hand the critical importance of higher education in a naval officer's career. It is important not only for the technical competence and skills gained in specific fields of study, but also for the expansion of one's mental horizon achieved from exposure to a broad range of new ideas. Most importantly, however, higher education engenders a disciplined manner of examining problems, which is useful regardless of the technical requirements of one's duties.
>
> "Indeed, I have found that the method of thinking and problem- solving instilled during my attainment of an operations research degree has been useful in a variety of positions, most of them in the realm of national security policy. At the Naval Postgraduate School I acquired an educational storehouse and critical thought process that I have drawn on throughout my subsequent career, especially after achieving flag rank. All too often, senior leaders do not have time to build new intellectual capital — they just consume it.
>
> "The years I spent in Monterey were important in other ways as well. They allowed me to develop lasting bonds of friendship with my fellow students."[19]

[19] VADM John Scott Redd, letter to Prof. Rosenthal dated March 9, 1998.

TITLE

Point Paper: NPS and Civilian Universities Cost and Full-Time Equivalents

SOURCE

NPS Internal Document, Author Unknown, May 1997

ABSTRACT

The paper disputes CNA's conclusion that the Naval Postgraduate School costs are high when compared to civilian universities. Using charts to illustrate its facts, the paper points out that NPS' costs are actually lower — in fact, 50% lover than civilian universities. It calls CNA's cost comparisons misleading because they do not consider differences in FTE or costs between NPS and civilian universities.

EXCERPTS

"NPS does not support the comparison of schools based on cost alone. There are many less tangible issues that impact both the comparisons and the definition of costs. Technical versus management courses, laboratory and computer intensive work, and seminar courses all differ significantly in the resources required. NPS is working to identify and reduce these costs to be more efficient while achieving even greater effectiveness."

"Two key differences make comparisons between NPS and civilian schools incomplete or even misleading. NPS is a year-round school … Students are required to attend classes, professors are required to teach courses, and the administration continues to operate at full capacity. Other universities do not operate in this way. The students at NPS are all graduate students. Most are pursuing master's degrees with a small number of students working on their doctorates."

"The CNA report treats FTE as an estimate of AOB without consideration of the differences. This use of FTE overstates AOB for civilian universities by up to 20 percent, as compared to 5 percent for NPS. Although NPS does not support the comparison of schools based on cost alone, the comparison of costs per AOB would better reflect the differences than the comparison made by CNA (Cost per FTE)."

"CNA included total costs, graduate and undergraduate combined, for selected universities and concluded that NPS costs were high in comparison to civilian universities … A regression analysis of the percentage of graduate students at a university and total educational dollars reveals that the greater the percentage of graduate students, the higher the cost per FTE. This illustrates that NPS costs are actually lower than expected when compared to other schools. In fact, NPS has been able to hold *costs to 50 percent lower than what would be expected.*"

CD REF NO. PW–24

POINT PAPER

NPS and Civilian Universities Cost and Full-Time Equivalents

NAVAL POSTGRADUATE SCHOOL
MAY 5,1997

NPS AND CIVILIAN UNIVERSITIES COST AND FULL-TIME EQUIVALENTS

Issue:

- The cost comparisons made by CNA draft report CRM97-0024-09 are misleading. They do not account for significant differences in either FTE or costs between NPS and civilian universities.
- NPS does not support the comparison of schools based on cost alone, however if comparisons must be made, they should accurately reflect these differences.

CNA used data from the Integrated Post-Secondary Education Data System (IPEDS). IPEDS states that "The definitions and instructions for compiling data have been designed to minimize comparability problems. However, post-secondary educations institutions differ widely among themselves.

Background:

- Two key differences make comparisons between NPS and civilian schools incomplete or even misleading.
- NPS is a year-round school. There are no differences in the types of courses offered, students who take those courses, or enrollment levels for the summer term. Students are required to attend classes, professors are required to teach courses, and the administration continues to operate at full capacity. Other universities do not operate in this way.
- The students at NPS are all graduate students. Most are pursuing master's degrees with a small number of students working on their doctorates.

Discussion:

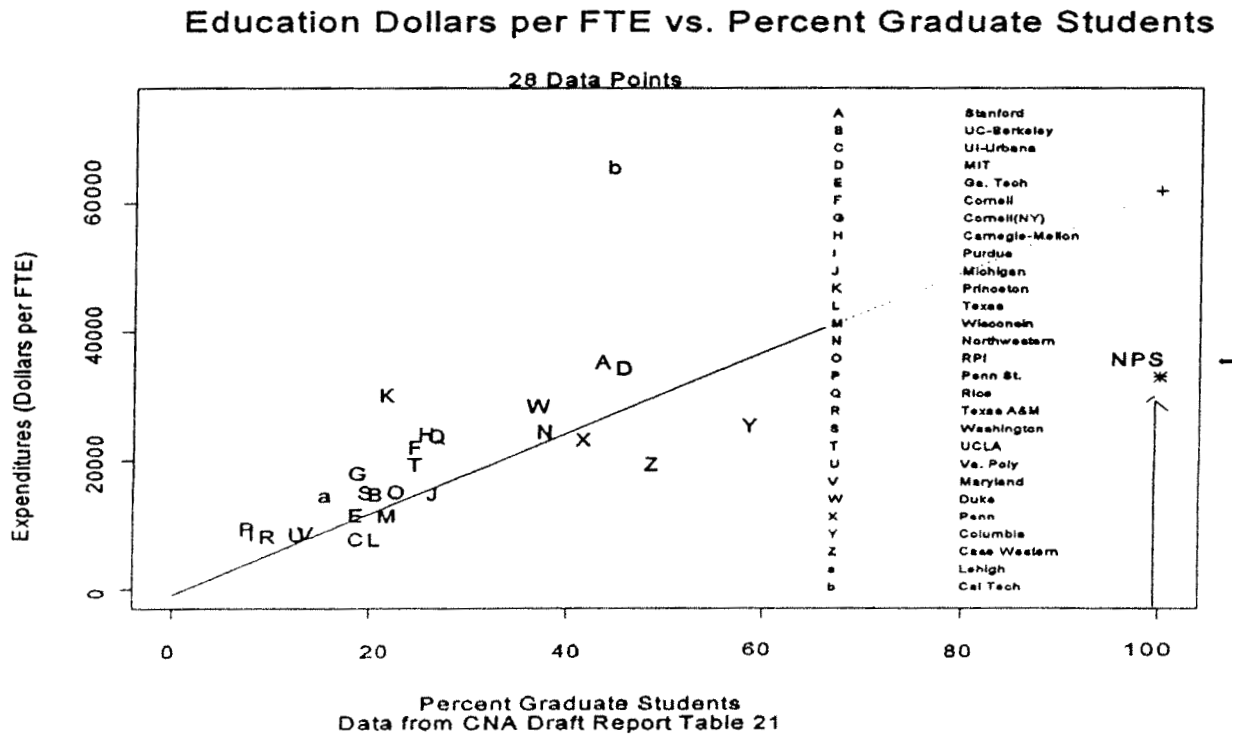
- The CNA report used cost per FULL-TIME EQUIVALENT (FTE) to compare NPS with civilian universities. FTE is defined as the number of students that a university has onboard at its peak enrollment (midway into the fall term).
  - ~ For civilian universities, FTE is a high estimate of the number of students the university will support in the 9–10 month academic year (September through May/June). FTE in this case is not a good measure of the average number of students over the calendar year.
  - ~ For NPS, FTE is both an estimate of how many students the university will support over 12 months and a good estimate of the average number of students onboard throughout the year (AOB).
- The CNA report treats FTE as an estimate of AOB without consideration of the differences. This use of FFE overstates AOB for civilian universities by up to 20 percent, as compared to 5 percent for NPS.
- Although NPS does not support the comparison of schools based on cost alone, the comparison of costs per AOB would better reflect the differences than the comparison made by CNA (Cost per FTE).

FTE is further defmed as the number of full-time (IT) students plus one-third the number of part-time (PT) (ITE = IT+ 113 PT).

- FULL-TIME STUDENTS (IT) as defmed and reported by the universities are generally students taking 12 or more credit hours of instruction per term and/or

Enrollment Numbers
FTE is derived from Fall Enrollment Figures

	Fall	Winter	Spring	Summer	FTE	AOB	FTE/AOB
University A:	2881	2651	2514	1266	2785	328	1.20
University B:	3563	3402	3199	2189	3325	3088	1.08
University C:	4592	4268	4184	2591	4439	3908	1.14
NPS:	1505	1403	1314	1494	1505	1429	1.05



those paying full tuition and fees for institutions that charge a flat rate. At NPS, full-time students take 16 credit hours per quarter.

- PART-TIME STUDENTS (PT) are those enrolled in fewer than 12 credit hours of instruction. Many of these students are not taking classes but are working on their dissertations.

Graduate Versus Undergraduate Programs

- CNA included total costs, graduate and undergraduate combined, for selected universities and concluded that NPS costs were high in comparison to civilian universities.
- While it is difficult for universities, or CNA, to separate costs for graduate programs, it is widely acknowledged that graduate programs are more expensive than undergraduate.

  ~ The University of California system developed a weighting system based on the level of course offered. Graduate level courses were weighted more than undergraduate (2.5 to I .0). The UC system now accounts for the percentage of graduate students in determining the baseline budget.

- A regression analysis of the percentage of graduate students at a university and total educational dollars reveals that the greater the percentage of graduate students, the higher the cost per FTE.
- This illustrates that NPS costs are actually lower than expected when compared to other schools. In fact, NPS has been able to hold *costs to 50 percent lower than what would be expected.*

NPS does not support the comparison of schools based on cost alone. There are many less tangible issues that impact both the comparisons and the definition of costs. Technical versus management courses, laboratory and computer intensive work, and seminar courses all differ significantly in the resources required. NPS is working to identify and reduce these costs in order to be more efficient while achieving even greater effectiveness.

NPS and Civilian Universities Costs Per FTE (with Adjustments for NPS Costs and FTE)

				EXPENDITURES PER FTE					
	FTE	Adj FTE		Total	Education	Instruction	Acad Spt	Student Spt	Inst Spt
NPS									
	1784			50,115	27,726	20,414	5,309	0	2,002
		2052							
	(NPS FTE adjusted to reflect same relationship between enrollment and FTE as civilian universities								
	COSTS PER ADJUSTED FTE								
				43,570	24,105	17,748	4,616	0	1,741
	COSTS ADJUSTED FOR GRADUATE VS UNDERGRAD (Using Adjusted FTE)								
	(Costs adjusted to reflect higher cost of graduate education programs)								
				37,035	20,489	15,086	3,924	0	1,480
STANFORD	7051			67,672	35,939	19,022	7,402	2,131	7,385
CAL TECH	1011			123,689	66,211	42,865	3,117	3,039	17,190
MIT	5115			70,850	34,918	18,739	4,056	1,812	10,311
GA TECH	3155			27,022	12,102	7,358	1,416	544	2,784
RPI	1841			22,275	15,794	9,424	2,226	761	3,383
DUKE	4841			48,888	28,987	19,309	4,167	1,225	4,286
Columbia	10841			59,923	26,112	20,052	1,753	0	4,307
Case Western	4236			38,068	20,069	11,777	3,509	1,321	3,461
	Cost Source: CNA Report: A Bottom-Up Assessment of Flagship Institutions (Sponsor Review Version) and IPEDS								

COSTS PER GRAD

	NPS				CIVINS (N=~50)	
	21 mos	**18 mos**	**15 mos**	**12 mos**	**18 mos**	**15 mos**
ACADEMIC / SUPPORT (1)	$ 73K	$ 63K	$ 52K	$ 42K	$ 21K	$ 18K
STUDENT / MPN (2)	$ 117K	$ 100K	$ 84K	$ 67K	$ 115K	$ 96K
Total	$ 190K	$ 163K	$ 136K	$ 109K	$ 136K	$ 114K
Class Hours (3)	1344	1152	960	768	729	608
Cost/Student Class Hour			~$ 142		~$ 187	

(1) NPS Academic costs include military instructor, curricular and enlisted costs

(2) Student MPN at NPS reflects lower costs due to use of family housing. Costs of NPS family housing are included in academic/support costs. Data based in N81 study of 29 Mar 93; costs inflated to FY96.

(3) Average Class Hours per year :

	Hrs/Wk	x Weeks	=	Class Hours
NPS				
4 Quarters	16	48		768
CIVINS (N=~ 50)				
2 Semesters	13	32		416
Summer	7	10		70
			Sub Tot	486

TITLE

The Naval Postgraduate School — A Review

SOURCE

NPS Internal Document, Author Unknown, Date Unknown

ABSTRACT

The unique military curricula and opportunities that the Naval Postgraduate School offers are reviewed, including its rating as the Department of Defense's "highest military value educational institution," its opportunities for students to develop relationships with U.S. and international officers, and NPS' collaboration with institutions to strengthen its programs in national security and defense.

EXCERPTS

"NPS is a professionally oriented, graduate research university that, like other research universities, creates new knowledge, synthesizes new and existing knowledge, and transmits the knowledge through publication and the education of graduate students. NPS' unique role is that defense and national security constitute its knowledge base: it is the only research university with this clear focus on defense and national security."

"NPS has an excellent and diverse student body; a first rate faculty, many members of which are nationally and internationally recognized as leaders in their academic fields and in defense applications; secure facilities and an ability to conduct classified research; educational, research, and service missions that are tightly focused on military and national security issues; and the ability to provide graduates, expertise, and knowledge that make fundamental contributions to solving our nation's national and international security problems. No other institution of higher education in the country has made such a tightly focused commitment to national defense and homeland security."

"Another critical NPS contribution is the enormous impact of having over three hundred allied and international officers spending 18–24 months living, learning and discovering side by side with Navy, Marine, Army and Air Force officers how to conceptualize, analyze, and solve the global challenges that we all face in the 21st century. The mutual understanding, trust, and goodwill that result from intensive interactions across this 'global village' of future military leaders may in fact contribute as much to international peace and harmony as does their formal education."

CD REF NO. PW–25

The Naval Postgraduate School
A Review

In its almost 100 year history, NPS has evolved from a single engineering department at the US Naval Academy into the nation's premier defense-oriented research university. NPS provides the DOD with an effective, diverse, and sustainable educational institution that supports current and future readiness, advances in technology, and the educational programs that facilitate getting our superior technology into the hands of the warfighter. Generations of Navy leaders have provided the nation with a university that is ideally suited to support our efforts in waging a global war on terrorism and the Department's technical transformation. '

As an institution chartered to concentrate on technology and technologically oriented areas of discovery, the Naval Postgraduate School has operated for almost a century with clearly defined visions and missions. NPS has an excellent and diverse student body; a first rate faculty, many members of which are nationally and internationally recognized as leaders in their academic fields and in defense applications; secure facilities and an ability to conduct classified research; educational, research, and service missions that are tightly focused on military and national security issues; and the ability to provide graduates, expertise, and knowledge that make fundamental contributions to solving our nation's national and international security problems. No other institution of higher education in the country has made such a tightly focused commitment to national defense and homeland security.

NPS is rated as the DoD's highest military value educational institution. The Technical Joint Cross Service Group (TJCSG) computed Military Value Scores for more than 200 technical facilities. NPS was one of only five facilities that received a military value score for each of the 13 research technical areas considered by the TJCSG. The other four were: Wright-Patterson AFB, NAS Patuxent River, Naval Research Laboratory, and White Sands Missile Range. This points out the breadth of the research undertaken at NPS and the clear focus on areas of primary importance to DOD and the warfighter. The TJCSG also identified 17 technological areas as having "significant importance to future warfighting capabilities." NPS faculty and students are involved in various research projects that shpport all 17 technologies. It is worth noting that the TJCSG evaluated technical facilities across 13 different technical areas and in three functional areas: Research, Deyelopment and Acquisition, and Test and Evaluation. NPS received the highest military value rating of all facilities in "Battlespace Environments, D&A."

Another critical NPS contribution is the enormous impact of having over three hundred allied and international officer spending 18–24 months living, learning and discovering side by side with Navy, Marine, Army and Air Force officers how to conceptualize, analyze, and solve the global challenges that we all face in the 21st century. The mutual understanding, trust, and goodwill that result from intensive interactions across this 'global village' of future military leaders may in fact contribute as much to international peace and harmony as does their formal education. As future military operations become increasingly more joint and international, it is imperative that our officers understand, appreciate, and interact with their foreign counterparts with the sensitivity, intelligence, and grace that can only come from sustained experience with our international allies and partners. NPS provides an ideal environment for those relationships to flourish; its close proximity to the Defense Language Institute and other partners in Northern California enriches the learning experiences for all its students.

The NPS has reached out to partner with many institutions to strengthen its programs and improve its support for national security and defense. An NPS, UCSB collaboration greatly enhances the support and capabilities of all US military commands and warfighters: UCSB world-class semiconductor and nano-fabrication facilities and the operational

experience of NPS faculty and students are coming together to develop new sensors, secure integrated circuits, electro-optical components, and materials for specific military applications. A long-standing relationship with the Lawrence Livermore National Laboratory (LLNL) has been facilitated by the NPS location in Monterey, California. For more than ten years, individual faculty members and researchers have been collaborating on research projects, sensitive and classified workshops and the graduate education of NPS and UC students. These projects span many areas of science, technology and policy that are critical to National Security. The current list includes, Homeland Security, Energetic Materials, Space Operations and Systems, Information Operations, National Security/Counter-Proliferation (CAPS), Global Security, Modeling, Simulation & Analysis, Defense Field Experimentation and Exercises, C4ISR, Laser Weapons and Communications, Sensors and UAVs and Meteorology and Oceanography. This month, we are signing a Memorandum of Understanding to create a joint Institute for National Security, Science amd Technology with NPS and the University of California Santa Barbara.

There is a perception that the NPS simply offers master's degrees in engineering, science, business, public policy and security studies that are also offered at many of our best civilian universities. This is simply not the case. The NPS programs are highly specialized national security education programs that include:

- Traditional masters level courses found at civilian universities;
- Coursework, that has a DOD or national security content not offered at civilian universities;
- Courses that are intensely DOD-centric which satisfy special DOD requirements, outside of the master's degree requirements, that cannot be found elsewhere in the U.S.;
- Thesis research projects that are in direct support of the nation's warfighters and national security requirements that would not be available at civilian universities.

NPS is a professionally oriented, graduate research university that, like other research universities, creates new knowledge, synthesizes new and existing knowledge, and transmits the knowledge through publication and the education of graduate students. NPS' unique role is that defense and national security constitute its knowledge base: it is the only research university with this clear focus on defense and national security. The unique synergy provided by bringing operationally experienced officer-students together with nationally ranked, seasoned, defense-oriented faculty is an essential step in forming the military forces of the 21st century.

TITLE Post Graduate Education in Naval Engineering

AUTHOR Lieutenant Commander John Halligan, Jr., U.S.N. Member

PUBLISHED Post Graduate Education, Naval Engineering Pages 215-229 • 1939

ABSTRACT The importance and history of postgraduate education in engineering for Naval officers is the focus of this chapter. The scope of Naval engineering, the history of Naval postgraduate education, and the development of the postgraduate department at Annapolis are reviewed.

EXCERPTS

"For nearly thirty years naval constructors have been given postgraduate courses, generally of three years, at technical schools in England, France and Scotland, and more recently at the Massachusetts Institute of Technology. The Bureau of Ordnance has, since about 1905, instructed from three to five men annually for periods of one or two years at the steel plants, the Naval Gun Factory, and the Naval Proving Ground."

"In 1912 the title of the school was changed from 'School of Marine Engineering' to 'Post Graduate Department, U.S. Naval Academy,' and its field was enlarged to include the directing of the postgraduate work of the naval constructors, ordnance, electrical, radio and civil engineers … The present direction of development of the Post Graduate Department is toward providing in the first year at Annapolis common courses of high efficiency for all groups in the fundamentals of engineering."

"The predominant service opinion at present is that the headquarters [of the Postgraduate Department] should be at Annapolis, and that after one year's work here the men should be sent to universities not under naval control, for the purpose of broadening their viewpoint by contact with civilians. It seems important to maintain the first part of the course under the direct control of naval officers, in order to permit close observation of the students with a view to determining their fitness for subsequent postgraduate training, and because in the beginning it is important to indoctrinate them as to their future work. Other considerations are the availability of the well-equipped laboratories of the Naval Academy, and the proximity of the Naval Engineering Experiment Station."

"The young officer leaving Annapolis finds that his work lies largely with one or more of the various phases of naval engineering for 20 to 25 years until he obtains command rank … the inadequacy of his undergraduate training becomes apparent. The function of the Post Graduate Department is to supply this deficiency in engineering education and training."

CD REF NO. PW–26

Post Graduate Education In Naval Engineering.

BY LIEUTENANT COMMANDER JOHN HALLIGAN, JR., U. S. N.,

The midshipman enters the U.S. Naval Academy at an average age of about 18 years. He has had as a rule the equivalent of a high-school education. During his four years at Annapolis he is prepared for the manifold duties of a naval officer, there being no attempt at specialization. The ground covered in the undergraduate course is necessarily extensive. In addition to this engineering training the graduate midshipman must be proficient in Navigation and well grounded in Gunnery, Seamanship, Naval Tactics, Military Tactics, International and Military Law, and in French and Spanish.

Engineering training is emphasized; by means of textbooks, revised from year to year, and well-equipped shops and laboratories, supplemented by practical work onboard ship during the summer cruises, the midshipman is acquainted with the machines and appliances to be found on shipboard and with their method of operation. The hours assigned in the undergraduate course to subjects which pertain to naval engineering are as follows:

	Rec	Prep	Shop and Laboratory
Marine engineering and naval construction	442	589	138
Mathematics and mechanics	459	612	–
Electrical engineering, physics and chemistry	340	453	16
Ordnance	153	204	81
Total for four years	**1,394**	**1,858**	**235**
Average per week	**10.25**	**17.19**	**1.75**

The scope of the engineering field with which the graduate midshipman must have some familiarity is so extensive that the undergraduate course is necessarily descriptive in its nature, and time is not available for much fundamental theory. Even if time were available, it would probably be found unprofitable to give much instruction in theory at this early stage of the naval engineer's education. A better appreciation of theory comes after some experience has been had with its application.

The young officer leaving Annapolis finds that his work lies largely with one or more of the various phases of naval engineering for 20 to 25 years until he obtains command rank. When as head of a department onboard ship, as an inspector at a shipyard, as repair officer at a navy yard, or as a member of a technical bureau, he reaches a position of responsibility in connection with the operation, construction, repair or design of engineering material, the inadequacy of his undergraduate training becomes apparent. The function of the Post Graduate Department is to supply this deficiency in engineering education and training.

SCOPE OF THE FIELD OF NAVAL ENGINEERING.

The technical duties in the various phases of naval engineering for which postgraduate education is required are:

Hull Engineering (naval construction) The designing, building, fitting and repairing of hulls of ships, capstans, windlasses, steering gear and ventilating apparatus; the designing, construction and installation of certain ammunition hoists; the placing and securing of armor; the designing and installation of supports for everything attached to the hull of the ship, including armament and propelling machinery, electric turret-turning machinery, boat cranes, deck winches; the docking of ships.

Ordnance Engineering The designing, manufacture, purchasing and inspecting of guns and gun mounts, ammunition hoists, rammers, gun sights and telescopes, periscopes and other optical instruments, smokless powder, gun cotton and other high explosives, torpedoes and mines, torpedo tubes, air

compressors, armor, projectiles, small arms and in fan try equipments, fire-control apparatus.

The management of the Naval Gun Factory, the Naval Proving Ground, the Naval Smokeless-Powder Factory, and various naval magazines.

Electrical Engineering *At sea* — As electrical officers on shipboard, the operation and maintenance of all electric machinery, from the switchboard. *On Shore* — The designing, purchasing and inspecting of all electric machinery and appliances except turret-turning motors, ammunition-hoist motors, boat cranes and deck winches.

Radio Engineering *At sea* — As radio officers on staffs of commanders-in-chief, squadron and flotilla commanders; development and control of radio communication and maintenance of apparatus. *On shore* — Designing, inspecting, fitting and repairing of radio installations. The administration of the naval radio service.

Marine Engineering *At sea* — As chief engineers or assistant engineers, the operating, maintenance and repair of motive and auxiliary machinery. *On shore* — The designing, building, purchase, inspecting and repairing of propelling machinery, boilers, engines, pumps, distilling apparatus, refrigerating apparatus, dynamo engines. The management of the Engineering Experiment Station and of the Fuel-Oil Testing Plant.

Civil Engineering The designing and constructing of buildings and their permanent fixtures at navy yards and naval stations; harbor works; waterfront improvements; graving docks and floating docks; power plants; roads, streets, tracks; hoisting appliances, cranes, derricks; transporation equipment; steam shovels, dredges and pile drivers; fire apparatus.

HISTORY OF NAVAL POSTGRADUATE EDUCATION

For nearly thirty years naval constructors have been given postgraduate courses, generally of three years, at technical schools in England, France and Scotland, and more recently at the Massachusetts Institute of Technology. The Bureau of Ordnance has, since about 1905, instructed from three to five men annually for periods of one or two years at the steel plants, the Naval Gun Factory, and the Naval Proving Ground.

Until the past few years the naval civil engineers were appointed from civil life. They were, of course, graduates in civil engineering.

The necessity for postgraduate instruction in electrical and in marine engineering has been recognized sporadically during the past three decades, but the demand for it has not been insistent except during the past fifteen years.

Prior to 1900 naval propelling machinery was well standardized. The reciprocating steam engine was the only prime mover above the horizon. The undergraduate education at Annapolis, supplemented by training at sea, sufficed for the comparatively simple demands on engineer officers.

At present we are employing seven distinctly different types of propetling machinery; these are: Reciprocating steam engine; Parsons turbine, direct drive; Curtis turbine, direct drive; electric propulsion; turbines with mechanical reduction gear; Diesel engines; gasoline engines.

Producer-gas plants, hydraulic reduction gear, and combinations of the foregoing types have been seriously considered for naval use.

During this same period the electrical instatlations on shipboard have developed from insignificant to important dimensions.

To prepare the engineer officer to cope with and to assist in the rapid development of naval machinery, there is now required a thorough training in the fundamental theory of thermodynamics, machine design, strength of materials, metallurgy, electricity, applied mechanics and engineering mathematics.

It is important that in the postgraduate work fundamental theory be emphasized, because this is the naval officer's only opportunity to acquire theory. During the greater part of his active career he will be associated with engineering practice.

ORIGIN OF PRESENT POST GRADUATE DEPARTMENT

About 12 years ago, a class in marine engineering consisting of about six students, was organized in the Bureau of Steam Engineering. These men remained in the Bureau pursuing a course of reading under the guidance of an officer attached to the Bureau. They accompanied the Trial Board on acceptance trials of new ships, taking performance data of the machinery. In 1909, a School of Marine Engineering was established at the Naval Academy with a class of 10 men with experience of from 4 to 11 years since graduation. The course then established was one of two years' duration, and consisted of discretional reading by the student under the guidance

of the head of the department, and a tour on the Bureau of Steam Engineering trips during the summer to manufacturing plants. Each student was allowed to choose a specialty under engineering, and a technical library was accumulated with the idea of affording him access to all that had been written on the subject of his specialty.

The students found that they were hampered in their reading by the inadequacy of their education in mathematics. mechanics and thermodynamics. Notwithstanding this handicap, much good was accomplished in thus directing the attention of selected men to engineering. The subsequent engineering service of this and succeeding classes has been so conspicuously valuable as definitely to establish the importance of postgraduate education.

To meet the demand for training in fundamental theory, a system of lectures was introduced into the course. The services of distinguished engineers and educators were obtained, some of whom delivered series of lectures extending over periods as long as four months. These lectures were excellent in character, and certain of them have been published and afford valuable contributions to engineering literature. An effort was made to direct the reading of the students to the end that they would prepare themselves for the subjects covered by the lecturers. In many cases, however, it was found that this preparation was futile, in that there was insufficient control of the treatment of subjects by the lecturer, and the students found that the subject of the lecture was not that for which they had prepared themselves. It was natural, therefore, in the evolution of the school, that there should be established resident professors with a definite schedule of lectures, laboratory work, and preparation.

In 1912 the title of the school was changed from "School of Marine Engineering" to "Post Graduate Department, U.S. Naval Academy," and its field was enlarged to include the directing of the postgraduate work of the naval constructors, ordnance, electrical, radio and civil engineers.

In the course of development of the Post Graduate Department there has been much discussion and diversity of opinion as to where it might best be located and as to the extent to which the facilities of colleges and universities should be used. The predominant service opinion at present is that the headquarters should be at Annapolis, and that after one year's work here the men should be sent to universities not under naval control, for the purpose of broadening their viewpoint by contact with civilians. It seems important to maintain the first part of the course under the direct control of naval officers, in order to permit close observation of the students with a view to determining their fitness for subsequent postgraduate training, and because in the beginning it is important to indoctrinate them as to their future work. Other considerations are the availability of the well-equipped laboratories of the Naval Academy, and the proximity of the Naval Engineering Experiment Station.

The present direction of development of the Post Graduate Department is toward providing in the first year at Annapolis common courses of high efficiency for all groups in the fundamentals of engineering.

Courses which seem thus commonly to be required are: mathematics, mechanics, and applied mechanics; electricity; heat engineering; machine design; strength of materials; metallurgy, including the chemistry of steels and bronzes, and metallography; engineering laboratory; electrical laboratory.

With the exception of metallurgy, all the foregoing courses have been established.

THE PRESENT SCHOOL.

The Post Graduate Department, under Article 1,543, U.S. Naval Regulations, offers special training along the following lines:

- Hull engineering (naval construction), general
- Ordnance engineering, general and
  - (a) Gun Design
  - (b) Optics
  - (c) Explosives
  - (d) Metallurgy
- Electrical engineering, general
- Radio engineering
- Marine Engineering, general, and
  - (a) Design
  - (b) Shop Practices
  - (c) Metallurgy
  - (d) High-speed internal-combustion motors for aeroplanes
  - (e) Diesel engines, with their application to submarines
- Civil engineering

The location of the training of the various groups is given in Table I.

The administration of these courses is governed by a council consisting of the Superintendent of the Naval Academy, the head of the Engineering Experiment Station, the heads of the academic departments of marine engineering and naval construction, ordnance and gunnery, electrical engineering and physics, mathematics and mechanics, a naval

TABLE I

Courses	At Annapolis	Subsequent Training.
Naval Construction M.S.	7 mos., Feb. to Sept	2 years at Mass. Ins. of Tech. leading to degree of
Ordnance	4 mos., Oct. to Feb	6 mos., Naval Proving Ground. 4 mos., Steel Plant. 4 mos., Naval Gun Factory. 1 mo., Bausch & Lomb, Rochester, N.Y. 1 mo., Sperry Gyroscope Co., Brooklyn, N. Y. 4 mos., additional specializing at one of the foregoing.
Electrical Radio Marine Engineering	1 year	1 year, Columbia University, leading to degree of M. S. Summer of 2d year at Navy Yard, N.Y. Schenectady, N.Y. Sperry Gyroscope Co., Brooklyn, N.Y.
Civil Engineering	1 year	2 years at Rensselaer Polytechnic Institute, leading to degree of C.E. Summer work under direction of Bureau of Y. & D.

constructor, a civil engineer, and the head of the Post Graduate Department.

The head of the Post Graduate Department is an officer of engineering experience.

The staff of instructors at Annapolis is as follows :

		Per annum
H. A. Everett, Professor of Marine Engineering	S.B., Massachusetts Institute of Technology	$3,500
R. E. Root, Professor of Engineering, Mathematics and Mechanics	S.B., Morningside College M.S., State University of Iowa Ph.D., University of Chicago	$3,000
L. A. Doggett, Professor of Electrical Engineering	A.B., Harvard University M.E.E., Harvard University.	$3,000
J. G. Russell, Instructor in Engineering Subjects	S.B., Massachusetts Institute of Technology	$1,8oo
H. B. Lindsay, Instructor in Physics	S.B., Worcester Polytechnic	$1,8oo
H. E. Jenks, Instructor	S.B., Worcester Polytechnic	$1,8oo

The courses in chemistry are conducted by Prof. of Mathematics Paul J. Dashiell, U. S. N., who has charge of the undergraduate work in chemistry.

With the exception of Prof. Dashiell, none of the foregoing has any duty in connection with the undergraduate work at the Naval Academy.

Typical time schedules of the work at Annapolis are shown in Tables II, III and IV.

Detailed descriptions of the courses at Annapolis and elsewhere are contained in the Catalogue of Curricula and Courses of Study, of which a limited number of copies are available to officers who are interested in postgraduate training.

In this paper space permits only a general discussion of certain features of the work.

NATURE OF THE WORK

Someone has said that engineering is one part arithmetic and two parts common sense, and that of these the common sense is the more difficult to acquire. Naval postgraduate education aims to develop this quaility of common sense in the student. He is taught to think logically and his judgment is trained.

Some difficulty is experienced in weaning the students from the habits of memory study for marks, which they have acquired as midshipmen. Marks are not posted; each student is permitted to see his own, but is not acquainted with those of his classmates. The men are encouraged to study for what they can get out of the subjects, rather than for marks.

It will be noted from the time schedules (Tables II, III and IV), that the forenoons are generally devoted to lectures, or more properly recitations, and the afternoons to drafting room or laboratory work, the division of time between theory and practical work being about even.

There is scheduled about 55 hours work per week (lecture, laboratory and preparation). The homework required is about 15 hours per week — the men average 20 hours.

It has been found necessary to establish a control of the amount of preparation work assigned by the professors. This is secured by means of weekly reports from the students, detailing the time spent in the preparation of each subject. The reports are anonymous, and are therefore frank.

An important part of the course is the gymnasium work, to which there are assigned three periods a week, before luncheon. In each period there is 15 minutes of Swedish exercises, during which all muscles are flexed, followed by 45 minutes of handball. A handball league has been organized with scheduled games for teams comprising all the. students and instructors. Twenty-four players are accommodated at one time in the courts available. When the weather permits, tennis will replace handball; for this there are 24 courts available. The purpose of this scheduled exercise is to maintain the physical health of the students and to teach them forms of exercise which they may take to sea.

CHARACTER OF STUDENTS

Selection of officers for postgraduate instruction is made by the Navy Department from applicants of best service record, on recommendation of the tech-

nical bureaus concerned. The present requirements of sea service since graduation from the Naval Academy are, for the naval constructors and civil engineers, two years; for all other groups, five years.

The Naval Post Graduate student is unusual in the following respects:

1st. He has, in many cases, been chosen for postgraduate instruction because of aptitude in the practical application of the theory which he is subsequently to study.

2d He is ambitious and zealous. With very few exceptions he is disposed to work too much rather than too little.

3d. His time as a student is more valuable than is that of his instructors. The shortage of officers in the Navy is such that when an officer is detached from a vessel for purposes of postgraduate instruction he leaves a vacancy which cannot be filled. While a student he receives the pay of his rank, which is about $2,400 per annum.

Except in the cases of naval constructors and civil engineers, the services of the officers for postgraduate instruction can be spared for a period of only two years. It has been necessary, therefore, in naval postgraduate education, and particularly in that part of the course which is conducted here, to insist on high efficiency of instruction. The professors and instructors are selected with care and they are employed in sufficient number to permit individual instruction to the greatest possible extent.

NUMBER OF STUDENTS

Officers under instruction in the various courses in January, 1916, are as follows:

At Annapolis:
16 Marine engineers;
4 Electrical engineers ;
1 Radio engineer;
5 Ordnance men ;
5 Naval constructors.

At Columbia University:
7 Marine engineers (design option);
2 Marine engineers (shop practices option);
10 Electrical engineers;
1 Metallographist.

At Massachusetts Institute of Technology:
13 Naval constructors.

TABLE II.—ENGINEERING—FIRST TERM.

For Marine Electrical, Radio and Civil Engineers.

	9	10	11	12	1	2	5:30
Mon.	Thermodynam. lecture.	Study.	Mechanics lecture	Gym.			Marine engine design. Drafting room.
Tues.	Mathematics. Lecture A. Study B.	Lecture B. Study A.	Chemical laboratory.				Electrical laboratory.
Wed.	Electricity lecture.	Study.	Steam mach. lecture.	Gym.			Engineering laboratory.
Thurs	Mathematics. Lecture B. Study A.	Lecture A. Study B.	Chemical laboratory.				Engineering laboratory.
Fri.	Thermodynam. lecture.	Study.	Electricity lecture.	Gym.			Electrical laboratory.
Sat.	Study.	Applied mechanics	Laboratory reports.				

Assignment of Hours per Week to Subjects.

	Lecture or exercise.	Laboratory.	Preparation.
Mathematics	2	...	6
Mechanics	1	...	2
Applied mechanics	1	...	2
Thermodynamics	2	...	4
Steam machinery	1	...	2
Marine engine design	3½	...	1
Engineering laboratory	...	7	...
Electricity	2	7	4
Chemistry	...	4	...
Gymnasium	3	...	...
Totals	15½	18	21

NOTE.—For the 21 hours preparation per week, 6 hours are available in class room.

At Rensselaer Polytechnic Institute:
3 Civil-engineers.

At Steel Plants, Gun Factory, Nwal Proving Ground, etc:
9 Ordnance engineers.

The number of naval construction and of civil engineering students is governed by the prospective vacancies in those corps.

Of the ordnance, marine engineering, electrical and radio groups, the numbers are determined by the requirements of the service, insofar as they can be met in view of the existing shortage of officers for duty on shipboard.

The Bureau of Steam Engineering's statement of existing conditions in this respect is as follows :

"The Navy; as constituted and organized on January 1, 1916, required for efficient operation the following number of Post Graduate Engineer Officers below the grade of Commander:

TABLE III.—POST-GRADUATE DEPARTMENT.

NAVAL CONSTRUCTION.

Spring Term.

	9	10	11	12	1	2	5:30
Mon.	Mechanical lecture.	Study.	Heat Eng'g lecture.	Gym.			Laboratory reports.
Tues.	Mathematical lecture.	Study.	Heat Eng'g lecture.	Warship design.			Warship design.
Wed.	Mechanical lecture.	Study.	Electricity lecture.	Gym.			Electrical laboratory.
Thurs	Mathematical lecture.	Engineering laboratory.					Chemical laboratory.
Fri.	Mechanical lecture.	Study.	Chemistry lecture.	Gym.			Chemical laboratory.
Sat.	Mathematical lecture.	Engineering laboratory.					

Hours per Week.

	Lecture or exercise.	Laboratory.	Preparation.
Mathematics	3	...	6
Mechanics	3	...	6
Heat engineering	2	...	4
Chemistry	1	7	2
Warship design	4.5	...	...
Electricity	1	...	2
Electric laboratory	...	3.5	1.5
Engineering laboratory	...	6	2
Gymnasium	3	...	...
	17.5	16.5	23.5
Preparation hours in class			7.5
Home work			16

TABLE IV.—POST-GRADUATE DEPARTMENT.

Schedule for Ordnance Group.

First Term.

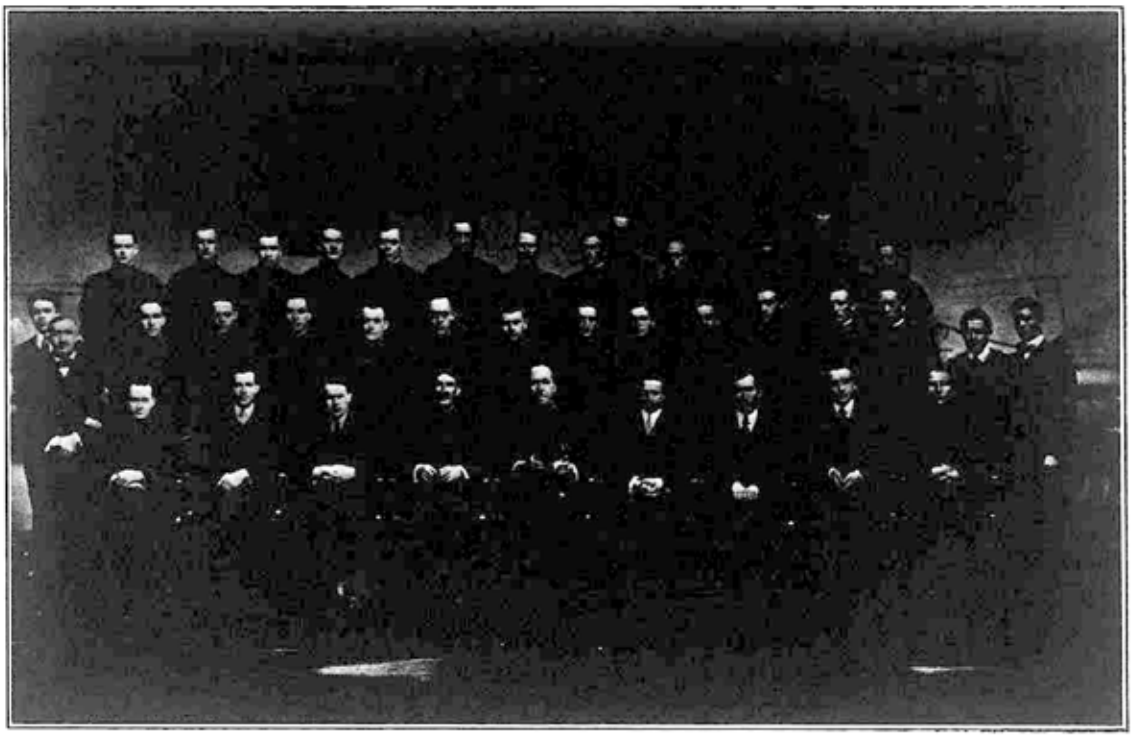
	8	9	10	11	12	1	2	4:30
Mon.	Ballistics.			Mechanics. Lecture. Study.		Gym.		Ballistics. Study.
Tues.	Mathematics. Study	Lecture.	Study	Metallurgy. Engineering laboratory.				Chemistry.
Wed.	Metallography.			Ballistics.		Gym.		Engineering laboratory.
Thur.	Mathematics. Study	Lecture.	Study	Chemistry.				Metallography.
Fri.	Mechanics. Study	Lecture.		Ordnance optics.		Gym.		Mechanics. Study.
Sat.	Mathematics. Study	Lecture.		Metallography.				

Assignment of Hours per Week to Subjects.

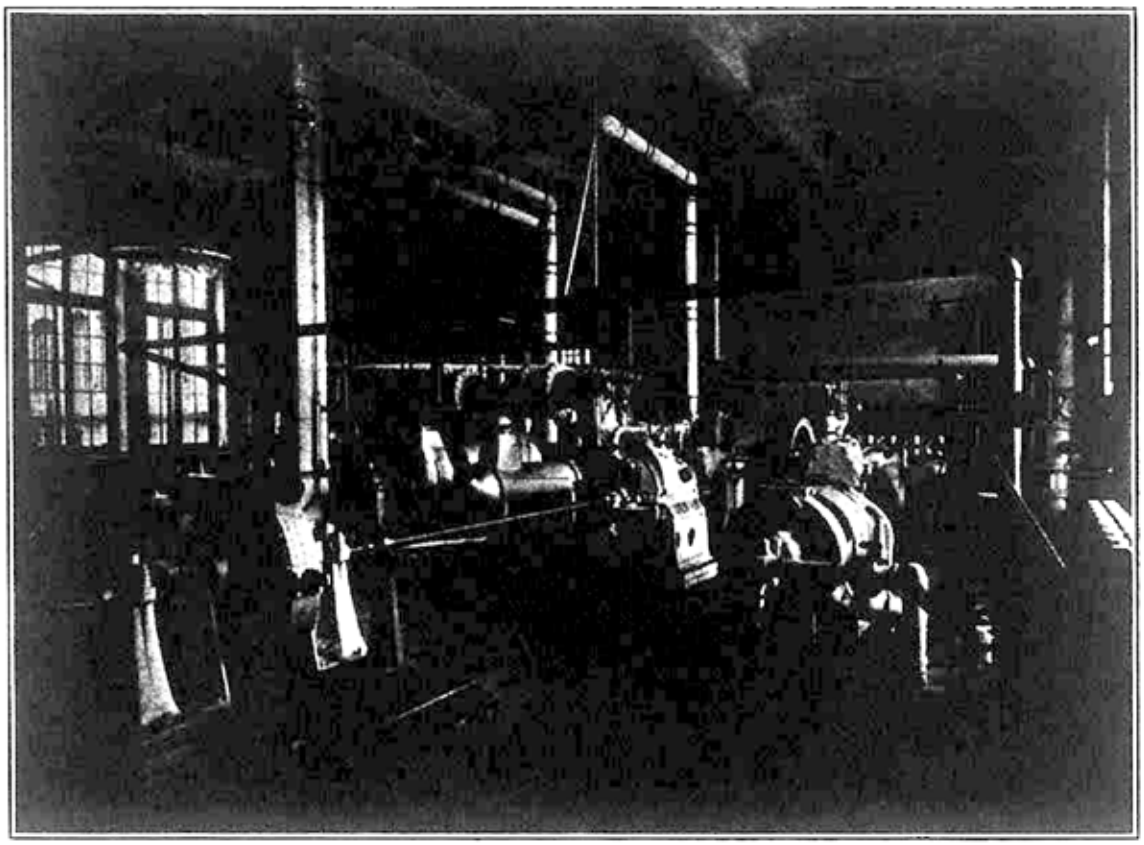
	Lecture or exercise.	Laboratory.	Preparation.
Mathematics	3	0	8
Mechanics	2	0	5
Mechanical engineering laboratory	0	2½	1
Metallurgy	0	2	1
Metallography	0	7½	3
Chemistry	2	2	2
Ballistics	4	0	4
Ordnance optics	1	1	2
Gymnasium	3	0	0
Totals	15	15	26

Fleet, Squadron and Flotilla Engineers	6
Battleships, First Line (7)-Engineer, Assistant, Electrical	21
Battleships, Second Line (18)-Engineer, Assistant	36
Armored cruisers (5)-Engineer, Assistant	10
Cruisers (all classes) (13)-Engineer Officer	13
Destroyers (38)-Engineer Officer	38
Submarines (37)	20
Inspectors and Assistant Inspectors of Machinery	12
Inspectors . and Assistant Inspectors of Engineering Material	6
In connection with ships building	11
Navy Department	14
Navy Yards and Stations	36
Total	**223**

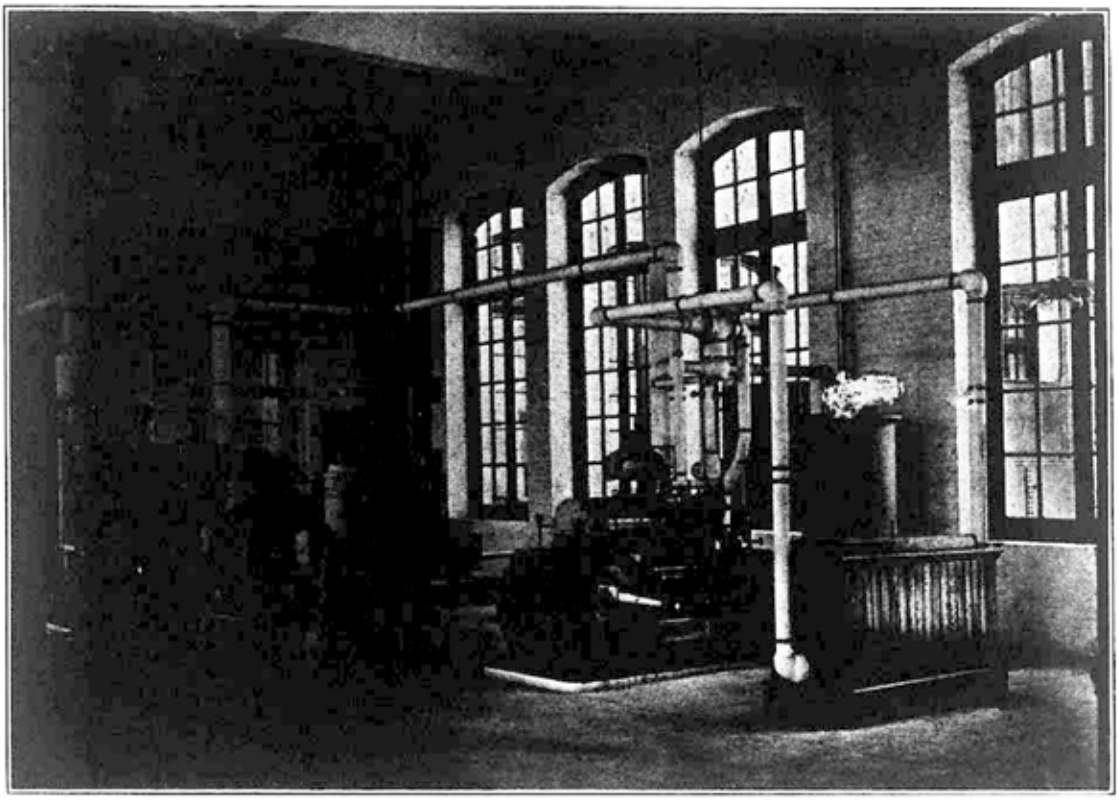
"There are fifty-six (56) postgraduates in the service and two hundred and twenty-three (223) are needed excluding the requirements of the ships building."



CLASS OF 1916, POST GRADUATE DEPARTMENT.



VIEW IN ENGINEERING LABORATORY.



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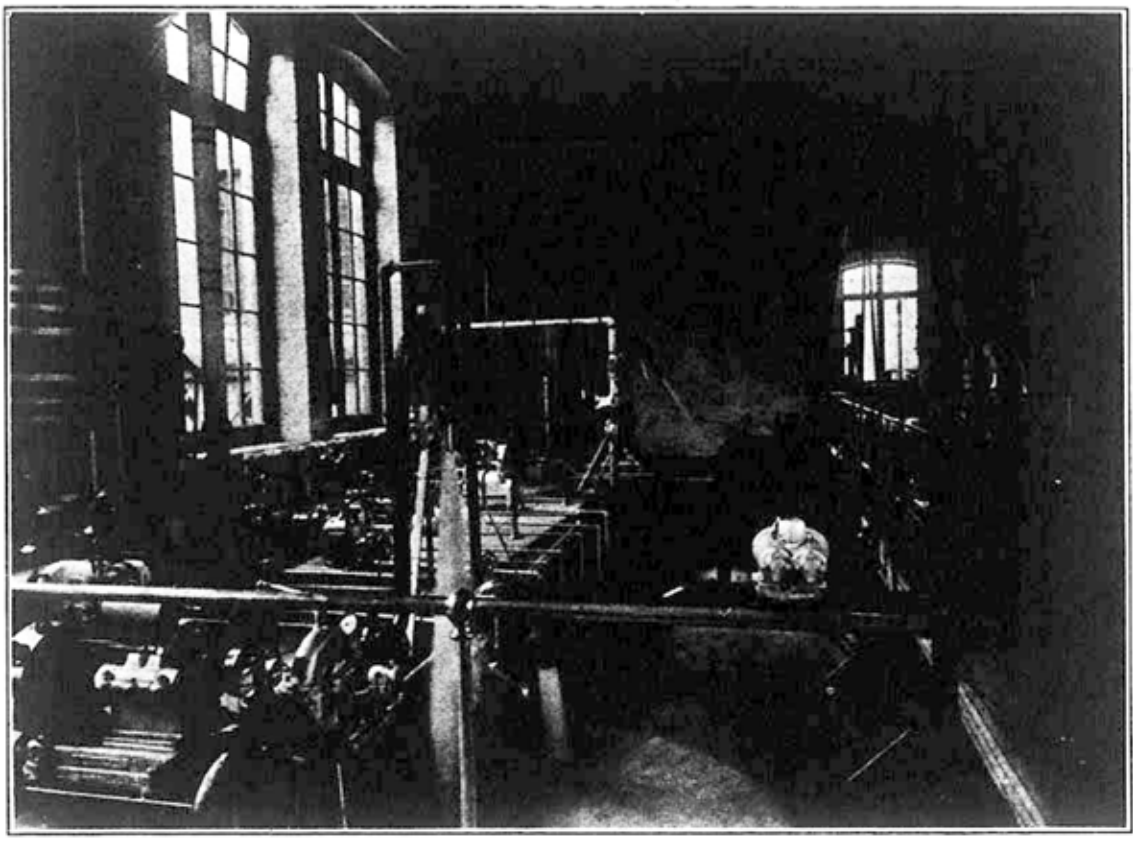

HYDRAULIC TANK.—ENGINEERING LABORATORY.

TITLE

Letter from Fleet Admiral Chester W. Nimitz, U.S. Navy to President [Melson] of the Naval War College • 24 September 1965

ABSTRACT

Admiral Nimitz wrote how important his training at the Naval War College was in his successful career and in preparing him to be an effective commanding officer during World War II. He praises the Naval War College and the Naval Post Graduate School.

EXCERPTS

"I credit the Naval War College for such success I achieved in strategy and tactics both in peace and war."

"…the courses (at the Naval War College) were so thorough that after the start of WWII — nothing that happened in the Pacific was strange or unexpected. Each student was required to plan logistic support for an advance across the Pacific — and we were well prepared for the fantastic logistic efforts required to support the operations of the war."

"To my horror — I learned that on "D" day — it was planned to close down the Naval War College and the Naval Post Graduate School in order to provide officers for our expanding Fleet — as was done on "D" day for WWI. I immediately cancelled those plans and prepared for expanded classes at both the Naval War College and P.G. School — we shortened the War College course to five months in order that more officers could be rotated through your fine institution."

"Again I credit the Naval War College with giving me the wisdom and foresight to see the need for these important changes in our personnel war planning."

"I regard your job as President of the Naval War College as being second only to that of CNO in importance and I congratulate you on having that fine billet. And I hope that your enjoyment of your duties is commensurate with their importance."

CD REF NO. PW–27

24 SEPTEMBER 1965

Letter from Fleet Admiral Chester W. Nimitz, U.S. Navy to President Melson of the Naval War College

Dear Melson,

It was my good fortune to be a member of the Naval War College Senior class that graduated in June of 1923 after a course of eleven months. Admiral Sims was President and the Depts. of Strategy and Tactics were headed by Captin Reginale Belknat and J. M. Reeves, respectively, both splendid leaders and instructors.

The enemy of our games was always Japan, and the courses were so thorough that after the start of WWII, nothing that happened in the Pacific was strange or unexpected. Each student was required to plan logistic support for an advance across the Pacific — and we were well prepared for the fantastic logistic efforts required to support the operations of the war.

The need for mobile up(?) at sea was foreseen, and even practiced by me in 1937 when I was a senior flag officer on the West Coast during a Feet Concentration in the Channel Islands Area. Of my classmates (both in the War College class of 1923 and USNA 1905) Captain R.C. McFall, now retired and living in La Jolla, Calif., devised the curricular tacthead formations used to successfully during WWII. The formations I personally took to the Pacific Fleet in late 1923 when I became Asst. Chief of Staff and Fleet Tacthead Officer for Admiral S.S. Robeson, USN, who was the C-in-C Battle Fleet, and succeeded Adm. Cooatz in 1925 as C-in-C U.S. Fleet. I continued to serve in my specialty as Asst. C of S and Fleet Tacthead officer in U.S. Fleet until late 1926, when I was sent to the University of California, Berkeley to start a Naval ROTC unit, the first in the U.S.

I credit the Naval War College for such success I achieved in strategy and tactics both in peace and war. When I became Chief of Bureau of Navigation in June 1939, my first act was to send for the NaBav War Plans. To my horror — I learned that on "D" day — it was planned to close down the Naval War College and the Naval Post Graduate School in order to provide officers for our expanding Fleet — as was done on "D" day for WWI. I immediately cancelled those plans and prepared for expanded classes at both the Naval War College and P.G. School — we shortened the War College course to five months in order that more officers could be rotated through your fine institution.

The great need for additional officers needed by BaNav was met by other programs—more NROTC Colleges, V-7, V-12 programs. The similar speed (?) and expansions took place in the P.G. classes. Again I credit the Naval War College with giving me the wisdom and foresight to see the need for these important changes in our personnel war planning. I regard your job as President of the Naval War College as being second only to that of CNO in importance and I congratulate you on having that fine billet. And I hope that your enjoyment of your duties is commensurate with their importance.

Warmest regards and best wishes,

Sincerely
C. W. Nimitz

FLEET ADMIRAL CHESTER W. NIMITZ, U. S. NAVY
QUARTERS ONE YERBA BUENA ISLAND
SAN FRANCISCO, CALIFORNIA 94130

24 September 1965

Dear Nelson:—

It was my good fortune to be a member of the Naval War College Senior class that graduated in June of 1923 after a Course of eleven months. Admiral Sims was President, and the Depts of Strategy and Tactics were headed by Captains Reginald Belknap and J. M. Reeves—respectively — both splendid leaders and instructors. The enemy of our games was always — Japan — and the Courses were so thorough that after the start of WW II — nothing that happened in the Pacific was strange or unexpected. Each student was required to

plan logistic support for an advance across the Pacific — and we were well prepared for the fantastic logistic efforts required to support the operations of the war. The need for mobile replenishment at sea was foreseen — and even practiced by me in 1937 when I was left as senior flag officer on the west coast during a Fleet Concentration in the Long Island area. One of my classmate (both in the war college class of 1923 and U.S.N.A. 1905) Captain R. C. MacFall — now retired & living in La Jolla-Calif — devised the circular tactical formations used so successfully during WW II. These formations I personally took to the Pacific Fleet in late 1923 when I became Asst

FLEET ADMIRAL CHESTER W. NIMITZ, U. S. NAVY
QUARTERS ONE YERBA BUENA ISLAND
SAN FRANCISCO, CALIFORNIA 94130

Chief of Staff & Fleet Tactical Officer for Admiral S. S. Robinson - U.S.N. - who was then C-in-C Battle Fleet - and who succeeded Adm. Coontz in 1925 as C-in-C U.S. Fleet & continued to serve in my specialty as Asst C of S. & Fleet Tactical officer in U.S. Fleet until late 1926 when I was sent to the University of California, Berkeley, to start a Naval ROTC Unit - the first in the U.S. I credit the Naval War College for such success I achieved in strategy & tactics both in peace & war. When I became Chief of Bureau of Navigation in June 1939 - my first act was to send for the Basic War Plans. To my horror - I learned that our "D"

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Warmest regards and best wishes.

Sincerely —

C. W. Nimitz

TITLE

Extracts from the Published Address of the Hon. Josephus Daniels, Secretary of the Navy, at the Opening Exercises of the Post Graduate School at Annapolis • June 1909

ABSTRACT

Daniels stresses the importance of engineering not only as the "creator of wealth" but cites educating Naval officers as engineers as having greatly helped to improve the Navy and a valuable skill helping officers in commanding ships.

EXCERPTS

"There must be specialization, but in addition there must be more general study of engineering problems by all the officers in the Navy. It ought to be impossible for any naval officer to reach the grade of captain who had not had an actual tour of duty as engineer officer as well to have studied engineering in the Academy and particularly in this post-graduate school."

"Although it is now a generally recognized fact, yet it is well to emphasize that the policy which was established some years ago of requiring all officers of the Navy to be educated as engineers and to require all officers to be capable of performing engineering duties has done more to improve the general efficiency of the Navy than any other one thing … I urge you to use every endeavor to utilize this opportunity to develop your expert knowledge [of engineering], with the idea principally in mind, that you will thereby be a more efficient officer and of greater value to the Navy and to your country…"

"Recognizing, however, that there is a particular need for a number of officers who have a more expert knowledge than can be required of all officers regarding the various types of the engines and machines, including the guns, which are placed in our fighting ships, we have established this special school, called the Naval Post Graduate School, to give a comparatively small number of officer of special qualifications this opportunity for specialization."

"There is no more inspiring story of the war than the heroism of the men on the Mt. Vernon when she was torpedoed. This characterized all the men of every rating from Capt. Dismukes, a skilled engineer officer, to the youngest recruit … But it was conspicuously true in the fire-room where the torpedo struck and where 37 men were killed … And yet by collective heroism, under plans already worked out by the captain and officers, mainly due to the engineering force, the miracle of that ship returning to port under its own power was witnessed to the glory of the American Navy."

CD REF NO. PW–28

JUNE 1909

Extracts from the Published Address of the Hon. Josephus Daniels, Secretary of the Navy, at the Opening Exercises of the Post Graduate School at Annapolis

Engineering has come to be the chief profession in America, for everything that moves depends upon the genius, knowledge and skill of men who are as much at home in overalls as in dinner coats, who love to make the wheels go round, and who understand that motive power is the centre of world progress and world prosperity.

There are four callings that add most to the sum of human wealth—the farmer, the miner, the artisan and the engineer. The last is an old profession as the water system and baths and roads of ancient Rome testify, but its expansion to cover all fields has been the outstanding creator of wealth of our day along with new lines. It makes land, the one thing it was said could not create. It carries the water power of Niagaras, great and small, to distant centres. It increases the fruit and grain of the toil and multiplies the product of the artisan and gives new value to mineral deposits. It makes possible girdling the globe on the sea, under the sea and in the air. And yet, because it works in the bowels of the earth and in the lowest decks of the ship and in places away from the crowd, the recognition it deserves has not hitherto been given to these creators of wealth.

When one takes a voyage across the ocean (and more Americans have crossed this year than in the preceding hundred years) he understands as never before what he owes to the men in the fire-rooms, are below the waters edge, who in a temperature that compels return to Adam's style of garment, make possible safe transportation in comfort. A visit from the bridge to the engine-rooms is an education in the achievement of the engineer, for in our modern use of the term a naval constructor as well as the men who design and build and operate the great engines in a modern ship as an engineer.

Thanks to American engineering skill, we run both these former German ships on less coal that when the much vaunted German efficients operated them, and we give better accommodations and are arranging of otherwise improving conditions aboard ship for these essential men.

There is no more inspiring story of the war that heroism of the men on the Mt. Vernon when she was torpedoed. This characterized all the men of every rating from Capt. Dismukes, a skilled engineer officer, to the youngest recruit. It was collective heroism. But it was conspicuously true in the fire-room where the torpedo struck and where 37 men were killed at the post of duty in the darkness without a moments warning. Immediately after the torpedo struck there was not only a maelstrom of inrushing water, but the fireroom was filled with soot and cinders and the shovels in the fire-room were thrown in various directions. The lights were put out and the fire-rooms were in darkness, but every man stuck to his job, the reserve crew hastened to lend assistance, climbing into what appeared to be a regular deathtrap, and when it almost appeared to everyone in the fire-rooms that the ship was sinking. And yet by collective heroism, under plans already worked out by the captain and officers, mainly due to the engineering force, the miracle of that ship returning to port under its own power witnessed to the glory of the American Navy.

Before this opportunity to display heroism, engineering skill had made possible in an incredibly short time the repair of the destruction the Germans had wrought before leaving this and other ships—one of the most subtle achievement of the war. But it was only a signal instance of engineering skill and illustrative of what was done in designing and build-

ing submarine chasers, mine-layers, Eagles, Destroyers and other craft of the character of the war demanded. The flight of the NC across the Atlantic was due to engineering skill and vision, as was the adoption of the electric drive on dreadnaughts.

We have made progress in naval engineering, but what has been done is but the earnest of what the younger men in their day will achieve unless we are to mark time and surrender leadership to others. In the immediate expansion of the merchant marine and in the larger ships the Navy is building, there will be not only ample opportunity, but compulsion for greater study of engineering progress afloat than in any previous decade. With automobiles and aircraft making new records on the land and in the air, engineering skill must be applied to faster ships and better working conditions on naval craft and on merchant vessels.

There must be specialization, but in addition there must be more general study of engineering problems by all the officers in the Navy. It ought to be impossible for any naval officer to reach the grade of captain who had not had an actual tour of duty as engineer officer as well to have studied engineering in the Academy and particularly in this postgraduate school.

Although it is now a nearly recognized fact, yet it is well to emphasize that the policy which was established some years ago of requiring all officers of the Navy to be educated as engineers and to require all officers to be capable of performing engineering duties has done more to improve the general efficiency of the Navy than any other one thing.

This is due to the fact that such a large part of every officer's duties involves handling or operating some kind of and engine or machine which is used for a fighting purpose in ships of the Navy and it is of course evident that the best results can only be obtained when the officers handling these machines have thorough understanding of their mechanics and their methods of operation.

It is frequently argued that the field of engineering is so vast that no one person can properly master it and in addition be a master of the other branches of the Naval profession. It is true that the filed of engineers is a vast one because in our ships of war we utilize machines for military purposes which involves nearly all the branches of this wonderful science. We have all the various types of steam engines, and, we might well say, gun engines, but the point which is frequently overlooked, is that there is a vast difference between the knowledge required to operate a machine and to build one. One does not need to know how to build an automobile engine in order that he may operate it in driving the automobile, although he can operative his automobile with better success and efficiency if he has some knowledge of the principles underlie the construction of the engine, and it is due to the fact that it is demonstrated that the officers of the Navy as a whole, can be trained to operate the engines and to do the general engineering duties, although it may not be practicable to train all officers to be expert designers of the engines.

A knowledge of one kind of machine also greatly assists one in understanding another kind of machine and if an officer has experience in operating the steam and electrical engines of a ship, he is better fitted to operate the gun engines of the ship and to operate the ship as a whole, which is really one large machine. The operation of the engineering departments of our ship also involves large amount of executive work, due to the large number of men required in the engineering departments and the experience which officers doing engineering duty have of this executive nature also fits them for the other executive duties of the ship, including that of the commanding officer.

And officer's entire service in the Navy is one of continuous training and should be one of progressive development, looking to the time when he is placed in command of the largest type of fighting ship, and if an officer has served in each of the various departments of a ship's organization, particularly in the engineering department, he is thereby much more capable to exercise the high office of command and is thereby better fitted to train and prepare his ship as a whole to meet the acid test of the day of battle.

Recognizing, however, that there is a particular need for a number of officers who have a more expert knowledge than can be required of all officers regarding the various types of the engines and machines, including the guns, which are placed in our fighting ships, we have established this special school, call the Naval Postgraduate School, to give a comparatively small number of officers of special qualifications this opportunity for specialization.

It is for the purpose of this special training as experts that you gentlemen are assigned to this school. The number of officers needed for this purpose, however, is not large and it is not deemed desirable nor necessary now to have a large and separately organized corps to perform these duties, although there must be a few officers who will be especially designated for the service as expert engineers throughout the entire length of their service in the Navy.

The time spent in gaining this expert knowledge is not lost but is of the greatest value, even though an officer may not be designated for this special duty throughout his career. On the other hand, he will be much better fitted to perform any of the various duties which he may have, due to this special training, for engineering proficiency is the most needed of all efficiency in naval officers. I urge you to use every endeavor to utilize this opportunity to develop your expert knowledge, with the idea principally in mind, that you will thereby be a more efficient officer and of greater value to the Navy and to your country for having taken this course, even though you may not be assigned the duties of an expert in any particular work, because after all, the highest ambition is to be a hundred per cent good, all-round officer of the Navy, ready to perform any duty which may be assigned to you.

TITLE EMBA Convocation, First Civilian Cohort

CD REF NO. PW–29

JUNE 16, 2011

EMBA Convocation, First Civilian Cohort

I addressed you two years ago when you first started this program and I was the newly appointed GSBPP Dean. The good news is that we are all have survived the two years and are still standing.

Graduating our first cohort in any new program is an exciting occasion, but particularly so for our first civilian EMBA cohort. I want to give my congratulations to the graduates, NPS and GSBPP, the Navy FM community, and the graduates' families, friends and co-workers.

Graduates: You have made a two year commitment to your professional development. You have completed 54 credit hours; that translates to 540 class hours; with 2–3 hours prep for every class hour, there is an additional 1080–1620 hours of work; that represents a total of 2000 hours; a federal work year is 2080 hours, so this represents 1 work year, or an additional half-time job on top of your already over 40 hour work week. This is a tremendous commitment on your part.

The tangible reward you gained from this investment, besides being sleep deprived for two years, is an internationally respected professional degree (an AACSB accredited EMBA; only about 5% of all business schools have this accreditation) with no debt (tuition ranges from $72K to over $110K in DC, with the average ~$80K - $85K).

We hope you have also developed friendships and connections with your classmates and faculty members that span the FM community and help broaden your perspective. Your classmates and faculty members create support networks you can draw on throughout the rest of your careers.

More importantly, we hope you have gained the knowledge and skills to improve the quality of your work. In a few conversations I had with graduating students, I heard that class concepts could be applied, in real-time, to your current work repeatedly throughout your program. This is a unique attribute of a part-time DL program such as this, where students complete their coursework while immersed in jobs that use the knowledge and skills they are honing. That is our hope and we welcome your feedback on our ability to deliver timely, relevant education. That direct application is a real advantage of a part-time program; one our resident students miss (resident students are fully immersed in education in our resident programs and only apply their new knowledge and skills after completing their degrees, and often only after an intervening operational tour).

Congratulations to NPS and GSBPP. An NPS strategic goal is to extend our education to the total force.

There are about 35,000 naval officers that in the ranks typical of our direct mission students. According to one of our current graduates, who reports weekly on this information to the CNO, there are currently 183,972 Navy civilians. Defense Department civilians require the same knowledge and skills as the officer corps., and use this knowledge every day in their typically longer careers (no deployments to drive ships or fly planes; and no retirement after 20 years).

It is very appropriate for NPS to extend the defense-focused education we provide military officers to the defense-sector civilian population (being a Navy-centric group, I will not extend these numbers to the other services and OSD, or our international partners, though the same relative orders of magnitude pertain there as well).

This program represents a contribution GSBPP is making to realize NPS' strategic goal (21 Navy civilian students down, 183,951 to go). I couldn't be happier that we can expand the audience for

our expertise to the Navy civilian FM workforce. I hope we can find similar avenues to include other Navy civilian communities and civilians across the defense establishment. You cohort has clearly demonstrated the value of doing so.

Congratulations to the Navy.

The Navy now has 21 EMBAs who significantly increased their human capital in their jobs, and, as indicated by our at least some of your classmates, those benefits have already been realized in the work you are doing. Your new knowledge and skills will also likely affect those working with you, as they recognize and replicate your new perspectives (something we economists refer to as educational externalities).

While the ROI on improved work performance is difficult to measure, much to our dismay, there is a very clear ROI measure for the Navy. The Navy budget is $800K for an EMBA cohort, start to finish (as noted before, that compares to over $2 million for a full cohort at the average cost of an EMBA in the NCR). As such, the Navy was able to provide you a non-monetary benefit, an accredited EMBA degree, for less than 40% of the cost for you to obtain that same benefit on your own. I suspect this can serve as an important and cost-effective retention mechanism, if the Navy commits to developing the human capital in its upper level management workforce. Again, this is an important contribution to the ROI for this program.

While improving the quality of your work and the value of a cost-effective non-monetary retention tool is hard to measure, there is a more tangible ROI measure. Of the five EMBA capstone projects completed for this cohort, the reported cost savings from three that can be implemented immediately total between $4.6 and $6.9M. That represents an ROI for between 575% and 862.5%. Not a bad ROI for the Navy and I suspect well in excess of most Navy investments. I am familiar with one of the other projects. It could also lead to savings in the millions of dollars if the Navy reconsiders its retention/reenlistment bonus policies. ROIs on this order of magnitude have been common for our Active Duty EMBA program, and we expect similar results from future civilian cohorts.

Finally, thank you and congratulations to our graduates' spouses, family, friends, and co-workers. You no longer have to suffer the late nights, lonely weekends, sleepy and distracted co-workers associated with the extra half-time job your graduates have borne.

I know I spent four years writing my dissertation after beginning a job at the JPL. When friends asked my wife and me what I would do with all my time after finally finishing, I answered get more than 4 hours of sleep a night; my wife answered that she had a four year long list of projects. I think I am still working on that list. I thank you all for the sacrifices you have made to support our graduates and ensure their success. Your sacrifices and support are an essential part of this program and we thank you for your forbearance.

Another thought for the spouses and families. Remember that our graduates have not incurred any cost or debt to obtain a degree worth in excess of $80,000. My question to the spouses and families, what will you do with all the money you saved?

I think this is an exciting occasion for the graduates, NPS and GSBPP, the Navy and the graduate's family friends and co-workers. Congratulations to us all!!

TITLE Remarks by Secretary Panetta at the Naval Post Graduate School, Monterey, Calif.

CD REF NO. PW–30

Remarks by Secretary Panetta at the Naval Post Graduate School, Monterey, Calif.

ADM. DANIEL OLIVER: Thank you very much. I know you didn't come to see me. (Laughter.) But we're very delighted — this is a great honor for the Naval Postgraduate School to have a couple of very distinguished guests here. My job is to introduce the first one and he will introduce our — the second and our guest speaker for this morning.

The Honorable Sam Farr is our congressman from the 17th district of California. He has been in the House of Representatives in Congress since 1993, and he is a strong advocate of the mission of the Naval Postgraduate School, of men and women in uniform, strategically positioned on the Appropriations Committee, and has been a great, great supporter of the school and an advocate of everything that we do here and all of those that come out of it. He is a fifth generation Californian, graduated from Carmel High School and Willamette University in Oregon. He spent two years in the Peace Corps in Colombia, South America, and is fluent in Spanish.

It's wonderful, Congressman Farr, to have you with us today. Thank you so much.

Please join me in a warm welcome for the Honorable Sam Farr. (Applause.)

REP. SAM FARR (D-CA): Thank you very much, Admiral Oliver, Admiral Moss (ph), Mayor Chuck Della Sala, and other distinguished guests and, most of all, students.

What a proud day for us here in Monterey to welcome home our native son. He left Monterey to be a congressman and then left Congress to go work for the Clinton administration, opened up a seat that the only way you can get elected — you can get into the House of Representatives is by an election, special election in 1993. I got elected to succeed him and have been reelected ever since. And it's a great pleasure for me to welcome back our native son, Leon Edward Panetta.

He's the 23rd Secretary of Defense, sworn in this year on July 1st. And before joining the Department of Defense, Leon served as the director of Central Intelligence Agency from February 2009 until June of 2011. Mr. Panetta led the agency and managed human intelligence and open source collection programs on behalf of the intelligence community. He took the leading in finding and removing Osama bin Laden from world terrorism.

Secretary Panetta has dedicated much of his life to public service, as well as his wife. Before joining CIA, he spent 10 years co-directing with his wife, Sylvia, the Leon and Sylvia Panetta Institute of Public Policy here at our own California State University at Monterey Bay. The institute is a nonpartisan, not-for-profit center which seeks to instill in young men and women the virtues and values of public service.

In March of 2006, he was chosen to be a member of the Iraq Study Committee, a bipartisan committee established at the urging of Congress to conduct an independent assessment of the war in Iraq.

From July 1994 to January 1997, Mr. Panetta served as Chief of Staff to President Bill Clinton. Prior to that, he was Director of the Office of Management and Budget, a position that built on his years of service as Chair of the House Budget Committee. He represented the 16th congressional district, which became the 17th congressional district, which will next year become the 20th congressional district, for 16 years, rising to chair of the House Budget Committee during his last final four years in Congress — positions himself very well for these future budget decisions that our nation has to make.

Early in his career, Leon served as a legislative assistant to Senator Thomas Kuchel of California, and as special assistant to the secretary of Health and Education and welfare director of the U.S. Office of Civil Rights and executive assistant to Mayor John Lindsey of New York. He also spent five years in law

practice here in Monterey.

He served as an Army intelligence officer from 1964 to 1966 and received the Army Commendation Medal. He also spent five years in private law practice.

Leon holds a Bachelor of Arts degree and an LLD degree in law, both from the University of Santa Clara. He was born on 28 June 1938 here in Monterey, where his Italian immigrant parents operated a restaurant. Later, they purchased a farm in Carmel Valley, where both he and Sylvia now make their home. The Panettas have three grown sons. Two are lawyers. One is a doctor. And they have six grandchildren.

Please give a big, warm NPS welcome to our friend, our neighbor, our secretary of Defense, Leon Panetta. (Applause.)

SECRETARY OF DEFENSE LEON PANETTA: Thank you. Thank you. Thank you very much. Thank you, Sam. Sam Farr has been a dear friend and someone that I've worked with a long time in a number of positions and was first on the board of supervisors and served in the assembly. Obviously now serves in the Congress. And he has been someone who has been incredibly important to this area in protecting the military establishments that are here.

And I thank him for the support that he has provided the military and his continuing support for the mission of the Navy Postgraduate School, Defense Language Institute, and the other installations here on the peninsula. He's been a true supporter.

Dan Oliver, great to be able to see you again and have a chance to visit here.

This is a special place for me and in many ways it's coming home. I am very proud of the Navy Postgraduate School, proud of its mission and proud of its dedication to protecting this country. As I said, this is a special place, first of all because this is my home.

Monterey is where I was born and raised. And I've had throughout my life a deep appreciation for the history of this wonderful location here, but more importantly a deep appreciation for the mission of the Postgraduate School.

I also in representing this area as congressman was very supportive of the school, its mission and the work that is so important to keeping this country on the cutting-edge of the future. In addition, not only as congressman, but as OMB Director and then Chief of Staff to the President worked very hard when threats came to the school through the BRAC process — not just once but a number of times — and had the support of the local community, Mayor Della Sala and Mayor Dan Albert and a number of others who worked very hard to put together a coalition in support of this school and its importance to the defense mission.

This isn't just important obviously for this community, but it is extremely important to the defense of this country. We were successful in making clear how important the school was. And when I came back actually to California, was appointed chairman of a base committee in California to continue to try to do everything possible to maintain the important bases here in this state.

But most importantly, most importantly, the reason that I'm honored to be here and have a chance to be with you is because of the very mission of this school. And the mission is one of teaching advanced skills, teaching the kind of technological capabilities to our military leaders, to our civilian leaders so that they are better able to lead this country as we would confront those that threaten our peace and our security.

As Secretary of Defense, obviously every day I look at a myriad of challenges that face this country, a range of security challenges that come from a lot of different directions, and as a result require the kind of leaders who are knowledgeable, who are creative, who are strategic, who understand the steps that have to be taken if we're to protect this country. One of the great thrills I have each day is to work with Mike Mullen, who is the chairman of the Joint Chiefs of Staff, who happens to be an NPS graduate from the class of '85. And he himself has called the Postgraduate School a national and international treasure. And it is.

In many ways, it's not just true for this school but it's true for all of you. Everywhere I go, in visiting the forces abroad, in visiting installations here, and for that matter when I was Director of the CIA having a chance to visit all of our stations across the world, the first thing I did was to thank all of those who are serving for their public service. And I do that to all of you. I thank you for your willingness to serve this country.

The strength of our democracy at the core of what a free society is all about is the willingness of those who are part of this country to serve it, to give something back. That was true for our forefathers. It was true for the pioneers. It's true for the immigrants. It's true for the men and women who have served in uniform throughout the years, throughout our history, the willingness to give something back to this country, to serve this country, to try to serve future generations so that they too can enjoy the remark-

able freedoms and liberties that are so precious to this country.

And, frankly, my story is the story of public service, 40 years of public service to this country. And I began really as the son of immigrants. As Sam said, I am the son of Italian immigrants who made their way to this country like millions of other immigrants in the early '30s.

My father was the 13th in his family. He had brothers who came over to this country, settled in different areas. And when he came over, he had two brothers at the time. One was living in Sheridan, Wyoming, and one was living here in California. The older brother was in Sheridan. So as is the tradition, he felt obligated to visit his older brother in Sheridan. And he did. My mother and I went up there and stayed with them. They stayed through one winter in Sheridan, Wyoming. (Laughter.) My mother said it was time to visit his other brother in California — (laughter) — which thankfully ultimately brought him here to Monterey. Thank God. (Laughter.)

He came to Monterey and, as Sam mentioned, ran a restaurant in downtown Monterey during the war years. And as you can imagine, that was a pretty rough location because this was a town where Fort Ord was the training base for those that were being trained for the next step, which was to go to war, either in the Pacific or Europe. And so Monterey was kind of a last piece of civilization. So it was — Monterey was kind of rough in those days. And I can remember — my earliest recollections were washing glasses in the back of that restaurant. My parents believed that child labor was a requirement. (Laughter.)

So soon after the war, my father sold the restaurant and bought a place out in Carmel Valley, where we now live, planted a walnut orchard and, again, worked hard out there in the orchard moving irrigation pipes and doing hoeing.

There's a great story that I tell because it makes a point. When I was a boy — and in those days my dad went around with a pole and hook and shook each of the branches in the walnut trees. And my brother and I used be underneath collecting the walnuts. When I got elected to Congress, my father said, you know, you've been well trained to go to Washington because you've been dodging nuts all your life. (Laughter, applause.) It's pretty good training, pretty good training.

But most importantly, I used to ask my father why would you come all of that distance to this country — no skills, no education, no money in their pocket. Why would you travel all that way to come to a strange country? And even though they came from a poor area in Italy, they at least had the comfort of family. Why would you leave that to come to this country? My father would say, both to my brother and I, the reason we did it is because we believed we could give our children a better life.

And in many ways, that is the American dream. That dream of giving our children a better life is what has been at the heart and soul of what America is all about. It's what they wanted for their children. It's what we want for our children and, hopefully, what our children will want for their children — to be able to give them a better life.

And in many ways, that dream is your dream. Your dream, your mission, your duty is to make sure that we provide a safer and a better life for our children in the future. And we do this at a time when we do face a number of important challenges that threaten this country.

We are today engaged in two wars, in Iraq and Afghanistan. Obviously, our hope is that for all of those, for all of those who served in those areas and continue to give their lives that we will do everything we have to do to prevail in those wars and to ensure that both Iraq and Afghanistan are stable governments that can govern and secure themselves for the future and ensure that they never become a safe haven for those who would attack those countries but more importantly attack our country.

So our hope is that as we begin draw downs in Iraq and draw downs in Afghanistan we do it in a way that ensures that these countries are stable, that they are secure, and that they build on the sacrifices that have been made, both by their people and by our men and women, so that they can become stable nations in key parts of the world for the future.

In addition, as we all know from the headlines, we continue to be involved in a NATO mission in Libya. And hopefully that is a mission that is beginning to draw to a close. The opposition forces have obviously made significant gains, but the situation obviously remains very fluid. We are continuing to monitor events there. But as the president has said, in many ways the future of Libya is in the hands of the Libyans. And we hope that they will decide that it is important to establish stability and important political reforms for the future after 40 years of Gadhafi.

One thing I am proud of is the mission that we have performed as a partner in NATO that we have, working with our NATO partners, obviously, and implementing the U.N. resolution that we are obligated to implement, we have protected civilians. We've estab-

lished a no-fly zone. And we have worked with our NATO partners in going after the kind of important support and assistance that was I think part of the key in being able to help the opposition forces there ultimately be able to succeed. It's a good indication of the kind of partnership and alliances that we need to have for the future if we're going to deal with the threats that we confront in today's world.

In addition, we continue the war on terrorism, even though we have made significant progress in weakening al Qaeda. As we approach the 10th anniversary of 9/11, we recognize that because of a number of efforts here and operations we have weakened al Qaeda's leadership. We have weakened their capability to be able to plan attacks in this country. But they still remain a threat. And now is the time to continue the pressure against them — not to lift it, not to walk away from it, but to continue the pressure.

The proudest moment I had as Director of the CIA was being able to work on the operation that took down Osama bin Laden. It was an example of our intelligence and military communities working together to go after an important target and to succeed.

But the reality is that al Qaeda still continues to operate, particularly in what we call the "nodes," places like Yemen and Somalia and North Africa. And we must never stop until we have been able to ensure that they have no place to hide and that they no longer represent a threat to this country.

We continue to have to deal with the threats that emerge from what I would call rogue nations, places like Iran and North Korea that continue to try to develop a nuclear capability and to undermine and threaten stability in those areas of the world. We must continue to do everything we can to ensure that those threats do not challenge stability in those very important parts of the world.

We now are dealing with cyber threats, another challenge that confronts us. In many ways I've said and I believe this is the battlefield for the future. We are now the target of literally hundreds of thousands of attacks every day. The capability to do cyber attacks is growing throughout the world. Countries like China, Iran, Russia, others are developing that capability. And I truly believe that as that technology increases, as that capability increases, the ability to paralyze this country is very real — to take down our power grid, to take down our financial systems, take down our government systems, to create the kind of paralysis that would indeed be comparable to a Pearl Harbor-type attack. We have got to be ready not only to defend ourselves but to be offensive in being able to go after those that would threaten our country in the cyber arena.

All of that combines with the situation in which we face rising powers throughout the world — China, India, Brazil, not to mention the continuing focus on Russia. Ensuring that we try everything we can to cooperate with these rising powers and to work with them, but to make sure at the same time that they do not threaten stability in the world, to be able to project our power, to be able to say to the world that we continue to be a force to be reckoned with.

Now, all of this, all of the challenges I've just described come at a time when there are increasing budget constrictions here at home. It's pretty clear that we are going to face resource limitations that we're going to have to deal with. We're a country that now has the largest deficit in our history, running about $1.4 trillion annual deficits, almost a $14 trillion national debt. There is no question that we're going to have take steps to discipline that budget and to put it on a glide path that restores discipline through to our fiscal arena.

I am not one — having worked on budgets for a good part of my career — I am not one who believes you have to choose between fiscal responsibility and national security. I think we can implement fiscal discipline in a way that protects the national defense. And that's what we're working to do.

Congress recently enacted as part of the debt ceiling increase a set of cuts on the discretionary side, cuts on defense roughly in the ballpark that Secretary Gates and President Obama had looked at as a possible target for savings in the defense arena. So while the decisions will be tough — these are not easy decisions to make — I really do think that we have an opportunity to be able to do this in a way that protects our national defense for the future, that develops agile forces, forces that are easily deployable, forces that can counter the threats that we're going to have to deal with in the future, weapons systems that can support that kind of quick deployability.

In addition to that, we have to make sure that we always protect our troops and their families and that we never break faith with those that are willing to serve. I think the opportunity is there. Now working with the service chiefs, working with the secretaries, working with all of those in the department, we are beginning to focus on how can we get this done in a way that will make us better for the future, in a way that will protect the best military for the future, in a way that will protect our core security interests in the future, and in a way that will protect faith with those that serve. All of that I believe is doable if we're

smart about it and we do it making the right decisions for the future.

But there is a greater danger out there. There is a greater danger. And the greater danger is that for some reason because of Congress' inability to be able to develop the kind of deficit reduction proposals that they're being asked to do, that they have fashioned what I've termed this doomsday mechanism of cuts across the board, the so-called sequester in which, if the committee fails to do its job, then what that will trigger is a sequester across the board, cuts across the board that could result in as much as $500 to $600 billion more in defense cuts, doubling the number of defense cuts that we're now dealing with.

This is a moment when in many ways the leadership of our country is going to be tested more than it ever has. If it's serious about dealing with the deficit, serious about dealing with the deficit — and I speak as someone who was involved in every major budget summit going back to the Reagan years. I worked with President Reagan on deficit reduction. I worked with President Bush on deficit reduction. We spent three months out at Andrews Air Base working on a proposal to reduce the deficit. And as OMB director for Bill Clinton — did the same thing.

If you're dealing with deficits in this federal budget, the reality is you cannot balance the budget just focusing on discretionary spending. You can't. Discretionary spending makes up about a third of the federal budget. Two-thirds of the federal budget is in mandatory programs. So if you're serious about reducing the deficit, you've got to focus on that two-thirds of the budget plus revenues. Every deal I worked on in budget included, yes, discretionary caps, but it also included mandatory savings and it also included revenues. So hopefully the committee that's been assigned to deal with this will have the courage to be able to confront those issues if they're serious about trying to reduce the deficit.

But I have to make clear — I have to make clear to the American people and to the leadership in Washington that if it fails to do that and it results in this sequester, even though the sequester is supposedly not to take effect until January of 2013. The reality is that it will be devastating to the defense budget. It will hollow out the force. It will weaken our national defense. It will undermine our ability to maintain our alliances throughout the world. And, most importantly, it will break faith with the troops and their families.

And so this is a time not only when we confront the challenges that I described, not only when we confront the challenge of having to deal with smaller budgets, but we also confront the challenge of making sure that the American people understand that this is a point in time when we cannot afford to weaken our national defense, when we cannot afford to be able to provide that safer and better life for our children.

Your fight is clear. Your fight is to get out there and continue to do your duty and continue to serve this country in the battlefields across the world. And our duty, my duty is to fight to make sure that you're protected so that you have the resources you need in order to do the job.

This is something I think that requires that all of us draw some inspiration from the most important assets we have, which are those that are out there putting their lives on the line. The toughest part of this job as Secretary of Defense — the toughest part of this job is that I have to do condolence letters to the families of those who have been killed in action.

And in line with that, just over the last few weeks that I've been Secretary of Defense, I've gone out to the war zones, looked the troops in the eye. I've been to Bethesda and to Walter Reed and seen those who have been terribly wounded as a result of those wars. I've been to Dover to greet the bodies of those who were killed in the helicopter crash in Afghanistan. And I've been to Arlington.

The greatest inspiration to me has been that in greeting the families of those who have died in the service of their country There isn't a family member that hasn't come up to me and said, if you really care about what happened to my son, my daughter, my brother and my sister, my husband, my wife, if you really care, you will carry on the mission that they gave their life for.

And so in many ways, the inspiration to carry on this fight rests with remembering those that have made that ultimate sacrifice and committing ourselves to carry on that fight that they were involved in.

Sam will know this and some of my friends here know this, but there's a great story I often tell of the rabbi and the priest who decided they would get to know each other a little better. So one evening they went to a boxing match thinking that if they went to events together they would talk, share each other's religion and better understand each other and their faith. So one evening they went to a boxing match. And just before the bell rang, one of the boxers made the sign of the cross. And the rabbi nudged the priest and said, what does that mean? The priest said, it doesn't mean a damn thing if he can't fight. (Laughter.)

My friends, we bless ourselves with the hope that

everything is going to be fine in this country, but very frankly it doesn't mean a damn thing if we're not willing to fight for it. You by your presence here make very clear that you are willing to fight for that American dream that brought my parents to this country, for the dream of making sure that our children have a safer and better life for the future, for the dream of making sure that we always keep in our hearts the sacrifices of those who gave their lives for this country, but most of all, that we always fight to ensure a strong government of, by, and for all people.

Thanks very much for having me here. (Applause.)

MR.: Mr. Secretary, on behalf of the students, faculty and staff here at the Naval Postgraduate School, I want to thank you, sir, for taking the time to come speak with us today. And we are honored to have you here to share your thoughts with us. And as a token of our appreciation, I'd like to present you with the NPS Centennial Book commemorating the first 100 years of our institution as well as the penning of Herrmann Hall here, sir.

SEC. PANETTA: Oh, great. Thanks very much. I really appreciate it. Thank you. (Applause.) Thank you.

I think we've got a few minutes. Sit down. We've got a few minutes for some questions if there are those that want to ask some questions. Yes.

Q: Sir, my name is Lieutenant Cirillo (ph) in the Business School. If the $600 billion in cuts are enacted, and many of us have seen the Defense Business Board's recommendation for retirement, what is your stance on the military's retirement, sir? (Laughter, applause.)

SEC. PANETTA: Why the hell did I know I was going to get that question? (Laughter.) As you know, Secretary Gates asked the board to take a look at the retirement system. And they've done that and they have some recommendations that they've made. They actually haven't completed the report, so I haven't really looked at their final report. And obviously no decisions have been made.

But let me just make clear to you that one of the commitments I've made is not to break faith with the troops or their families. And those that have been deployed a number of times have been deployed on the basis that ultimately they knew that they had a commitment with regards to their retirement. So if anything like that were ever to be thought of seriously, I wouldn't do it without grandfathering those that are presently in the service and making sure that they get the benefits that they're entitled to under the present time.

Having said that, you know — look, I think when you're dealing with these kinds of budget constrictions, I think it's important to look at all areas. Every time I've done a budget summit, my approach to it has been to say, let's look at every area to see whether or not we can make the important reforms, et cetera. There is something to be said obviously for young people that do come into the service and decide after four years to leave that right now, under the present system, they get nothing. So there is some thought that maybe they're entitled to some retirement to be able to move those funds to other systems. I think that's worth looking at.

But to respond to the question that I was asked, my view is we ought not to break faith with those that serve, that serve now and that if there were any changes that were to be made in the future, it would not have happen without grandfathering their benefits.

Q: Good morning, Mr. Secretary. I'm David Henderson, an economist, an economics professor also in the Graduate School of Business and Public Policy. Ohio State University Professor John Mueller stated in a recent article in Foreign Affairs, quote, "An al Qaeda computer seized in Afghanistan in 2001 indicated that the group's budget for research and weapons of mass destruction, almost all of it focused on primitive chemical weapons work, was some $2,000 to $4,000."

In your previous job, you yourself pointed out that there are fewer than two dozen key operatives left in al Qaeda. Given our huge budget deficit that you referred to, when do you say enough is enough? Let's end those wars because the costs are so much higher than the hypothetical small benefits?

SEC. PANETTA: The answer to that question is you end those wars when those individuals that have threatened to attack this country no longer are there to threaten this country. We have an obligation coming out of 9/11 to defend this country. That's what we're here to do. That's what we're all about is to make sure that al Qaeda and their militant affiliates never again attack this country.

And let me make clear that while we have made progress against al Qaeda and we have weakened their leadership, they still continue to plan attacks in this country. In the bin Laden compound, the intelligence that was gathered there indicated that bin Laden even there was continuing to focus on what could be done on the anniversary of 9/11 to see whether or not any potential for renewed attacks in this country might exist. That's what they do. That's what they plan. That's what they're committed to.

And I think we have to make sure that they never have that opportunity to again attack this country. And that means we continue to put pressure on them in the FATA. We continue to go after them in Yemen. We continue to go after them in Somalia and elsewhere to make sure that they never have the opportunity again to attack this country. I can't give you a timeline as to when that happens. But I know one thing: we should never give up until we have defeated their intent to try to attack this country.

Q: Thank you. (Applause.)

Q: Sir, Chief Warrant Officer Blalak (ph), U.S. Army, attending the cost management course here. Right now we've had tremendous success in the fight against Libya supporting our NATO allies. That has come to about $1 billion that we have spent. With the seized funds that the U.S. has from Gadhafi, can we recoup that money? (Laughter.)

SEC. PANETTA: Well, there's obviously been some discussion as to how those funds will be used. Right now I think the main focus is to try to see what we can do to provide funds to the TNC and the opposition forces and, hopefully, the transitional government there so that they will have the funds in order to do the rebuilding, in order to establish the systems that are important to stability in that country. We still haven't quite gotten through the various requirements that are out there in the United Nations and elsewhere that have put various restrictions on the funds that are out there.

But I think the first order of business obviously will be to try to provide those funds to the new government there so that they can do what they have to do to make sure that they establish a stable government in Libya.

Beyond that, you know, I don't think — I think the discussion as to whether or not NATO ought to be in some way reimbursed, I think that's still a subject that has not really been approached with regards to the Libyans at this point.

Q: Sir, Lieutenant Colonel Glenn Hodges (sp) in the modeling virtual environments and simulations curriculum here at NPS. On the 8th of March, the secretary of the Army stated to the House Armed Services Committee that modeling and simulation is absolutely essential to the Army. Recent resource decisions have impacted several of the Army's training programs that are enabled by modeling and simulation. Sir, what is your position on the value of modeling and simulation to the Department of Defense and what plans do you have to protect the resourcing that supports it?

SEC. PANETTA: Again, I depend a great deal on the advice that I received from the services as to what areas should be focused on. You know, in this job, my view is that we have to operate as a team. I can't protect the defense of this country without having the best advice that I can get. And I view the best advice that I get from the service chiefs who know what the hell they're talking about and have been involved in the battle and also have been involved in training aspects of what works and what doesn't work.

So without going into particulars, I'm still awaiting actually their recommendations with regards to some of the areas that they want to focus on. As I said, no decisions have been made. We basically have asked for a review — a comprehensive review — looking at all areas. But what I'm depending right now is to make sure that the service chiefs give me their best recommendations in a way — I mean, my guidance to them is do it in a way that protects our defense for the future.

We have today the strongest military force in the history of the world. We are the strongest military force not only in the world but I believe in the history of the world. And I think it's important for us to maintain that strength for the future. So don't tell me anything that's going to undermine our strength or our weakness for the future. Does that mean there aren't going to be tough decisions that have to be made? Yes, there are going to be tough decisions. But I want to make sure we don't do anything, particularly with regards to training, that undermines the ability to have the best-trained, best-equipped force that this country needs to have if we're going to confront the threats I talked about.

Q: Thank you.

Q: Mr. Secretary, D.D. Jones (sp) with academic and media services. What are the plans within DoD to address the Navy's lack of a high-speed, high-maneuverability air-security fighter to match the capabilities of aircraft being developed and produced by the Russian Federation and other potential threat nations?

SEC. PANETTA: Well, as you know, the effort we're going through now is on the Joint Strike Fighter. And the idea was obviously to develop a strike fighter plane that would be one that each of the services could use. And, as you know, in the development of that plane we've gone through a number of transitions because, obviously, the Navy needs to make modifications on that plane for purposes of taking it off a carrier. The Marines need to make modifications on that plane in order for them to have a STOVAL capability. And so there have been modifications. We're beginning to test the plane now. It's

in the test phase.

I think that plane will give us an important capability for the future. You know, from everyone I've talked to, they seem very pleased that it does in fact provide the capabilities that we need. But it's going to take a lot of work. It's still going through the test phase. We'll learn a lot from the test phase. But I think it's an investment that we ought to maintain for the future.

One more question.

Q: Hello, sir. My name is Rachel Goshorn. I'm a professor in the Engineering School and our C4I chair. My question revolves around the concern for not having enough intelligence analysts or experts in the future to predict and prevent terror threats, particularly when sensor systems are becoming so cheap and deployed everywhere and we won't have enough bandwidth to communicate this and our small satellites, unmanned systems won't have enough power.

So my question is, from your intelligence expertise, what is your view on automation in the future and automating intelligence analysts at our DoD systems? (Laughter.)

SEC. PANETTA: I'm still a believer that you still need to have two feet and a brain to be able to do the kind of intelligence that we need. I mean, there are areas, obviously, where we can make use of automation, where we can make use of new technologies. But very frankly, I have seen no substitute for having an asset on the ground being able to give you the intelligence that you need.

And, you know, now we have a myriad — obviously, we've got a myriad of intelligence capabilities, both in terms of technology, SIGINT, imagery, various satellites that provide additional elements to our intelligence. But when I have to know what's taking place with regards to a specific target or a specific area, the ability to have assets that are trained to go into that area and be able to see it, be able to report on it, is extremely important to our ability to have good intelligence.

So if you're going to put together the best intelligence — and that was my responsibility as Director of the CIA was to give the President the very best intelligence we could, to give him that intelligence depends on a lot of contributing factors that help you again be able to affirm the intelligence that you're getting.

Look, when we first got the track to bin Laden's compound, the key on that was the ability to track these couriers that at one time worked for Osama bin Laden, to track those couriers to the compound. We were able to do that using, obviously, a lot of new technology to be able to get that done. But, in addition, we used a lot of other intelligence to be able to continue to look at that compound, to continue to determine whether or not in fact bin Laden was there.

Let me tell you something. You know, we were never able to confirm the fact that bin Laden was there. And there were a lot of different opinions as to whether or not the intelligence showed bin Laden being there that ranged a great deal depending on one's background. But, in the end, as Director of the CIA I looked at that and I said, we have the best intelligence we've had since Tora Bora on where this guy may be. And the result of that intelligence came from a number of different areas that helped to build that case.

But in the end, I've got to tell you something and I think it's something you all know. In this business, in your business, ultimately you have to take risks. You have to take risks based on the best information you have, but you have to take risks if you want to get any damn thing done. And so based on that the President of the United States made a very courageous decision to proceed with that effort, and it paid off. But there are times when it doesn't pay off. There are times when you make mistakes.

But the important thing is to use every asset you have, every capability you have to build that intelligence. That is what the President needs. That's what policymakers need in order to make the decision. And, very frankly, my rule was as Director of the CIA, whether you like to hear it or not, you're going to hear what I know and you're going to hear the truth. And it's based on that and ultimately the decisions have to be made.

But I do think that with regard specifically to your question, I think we need to develop a lot of different approaches to intelligence. We've got to be willing to invest in new capabilities. But in the end, what you need are well trained, language-capable analysts who know what the hell they're looking at.

Okay. Thank you.

TITLE It's More Than a Job or an Adventure

CD REF NO. PW–31

AUTHOR By Richard E. Rosenthal

It's More Than a Job or an Adventure

An inside look at the Naval Postgraduate School, where teaching, learning and applying operations research is serious business for all concerned

BY RICHARD E. ROSENTHAL

Some people think of the Naval Postgraduate School as one of the nation's best-kept secrets. In the Operations Research World, NPS has a fairly large footprint, but still there are members of INFORMS who might not know much about NPS-OR.

I was introduced to operations research as a 19-year-old undergraduate by Professor Jon Liebman. My schooling until then was in math, which at Johns Hopkins meant theoretical math. I already had advanced calculus and linear algebra, and was learning about group theory and rings. To give you an idea of how theoretical it was, the linear algebra class was completely devoid of numerics, and it dismissed matrices as an insignificant special case of linear transformations. I knew I did not want to be so far removed from real-world problems but did not know where to turn. One of the luckiest days of my life was when I asked Dr. Liebman for advice. He lit my enthusiasm for OR and it has never diminished. It is very hard to imagine a better place than NPS to fulfill the career ambitions that Jon kindled in me.

The U.S. Navy created NPS in 1909, when Navy leadership realized that ships and weapons were getting so technically complex that the officers at sea would need more than undergraduate knowledge of engineering to keep these systems running. The school began as a postgraduate department at Annapolis and moved to its current breathtaking location in Monterey, Calif., in 1952.

The OR program at NPS was established in 1951, prior to its civilian counterparts, because of the importance of OR in WWII. Fleet Admiral Ernest J. King, in his official report on the Navy's performance in WWII, wrote that operations research "made it possible to work out improvements in tactics which sometimes increased the effectiveness of weapons by factors of three or five …" [1]. (For more NPS-OR history, see Schrady [2] and Washburn [3]. Washburn's piece points out that the PNS-OR curriculum bears strong resemblance to the ideal OR curricula put forth by Dyer et al. [4] and Larson [5].)

HIGHLY-MOTIVATED STUDENTS

The worst thing about NPS education is that it is not open to the public. Yet, some of the best things about NPS education derive from this fact. We know where our students are coming from — they are mid-career officers of the U.S. and allied military services — and we know what kind of work they will be doing when they graduate. Their employers maintain close contact with us, providing regular feedback on the effectiveness of our graduates.

The services pay our students full salaries, house them and their families, and provide complete medical care. Thus, we can work them at full throttle 48 weeks a year, with two weeks off at Christmas and the 4th of July.

The NPS students take their studies quite seriously. They are evaluated as military officers in part by how effectively they perform as students. So as professors, we generally have their complete attention.

People in the civilian world may not realize how important evaluation is to an officer. The military will only promote those whose careers have had experience and demonstrated mastery of subordinate roles, and in addition shown merit and achievement to deserve the next promotion. It is an "up or out" system, and there is no such thing as a sideways move. The U.S. Army does not poach talent from the U.S. Navy or from another country's services. Con-

trast this to the civilian world, where a freshly minted MBA might end up in an executive position, and a senior executive or even the CEO may be hired away from another company. Understanding the dynamics of military officers' careers is important for us in dealing with our students on an individual level and, incidentally, it creates opportunities for some interesting OR problems.

While we faculty are evaluating the students, so are they evaluating us. We pay close attention to our students, particularly their opinions of our instruction. These are professional military officers and keen judges of professional performance.

Every NPS-OR student writes a thesis. This is a huge commitment of faculty and student time, but an important one. Our graduates immediately assume positions of responsibility requiring constant reviews of technical work, reports, white papers, presentations and the like. We use the thesis exercise as a summary personal study course to hone OR analytical and expository skills.

Faculty do not use teaching assistants. We grade and advise personally. It helps that NPS has a remarkable 4:1 student-to-faculty ratio, and no class has more than 30 students. The flip side of having 45 OR faculty to share the thesis load is that we don't have enough courses to keep everyone teaching full-time. Consequently, faculty bring in about half their salary from research sponsors.

Distinguished Professor Jerry Brown advises new faculty: "Take good care of your students, they deserve it, and eventually you'll be working for one of them."

Brown should know: His thesis student U.S. Army then-Capt. Tom White went on to become a general and, later, Secretary of the Army. His linear programming student U.S. Navy then-Lt. Mike Mullen is now the Chief of Naval Operations, our nation's top naval officer. Mullen has been nominated to serve as Chairman of the Joint Chiefs of Staff, America's top military officer.

Brown continues: "That Admiral Mullen is best known as a problemsolver is no surprise, that's the core focus of our MS-OR program."

Indeed, many research sponsors are former students.

NPS-OR faculty frequently receive calls from former students, asking us to participate in solving exigent problems. In 2005, Professor Rob Dell got a call from Iraq from a graduate who needed help in planning airlifts. Within weeks, he and Brown were in country, and — while Professor Matt Carlyle was generating columns around the clock back home for their optimization model — they had a fleet- and cargo-scheduling solver up and running.

Professor Bob Koyak and his student, Marine Maj. Matt Reuter, are working a murky, but vitally important data analysis problem based on vehicle maintenance records from Iraq. In the accompanying sidebar, Koyak conveys the sense of urgency and excitement NPS students and faculty have about working on real problems.

Professor Moshe Kress and frequent visitor Professor Ed Kaplan of Yale have earned a great deal of attention with their models of suicide bombing [6]. *The New York Times* called this work one of the 50 most important ideas of 2005 and described its surprising findings to a wide audience [7].

Homeland security is a key theme in NPS-OR education and research. Professor Kevin Wood initiated the use of attacker-defender games, solved in the form of multi-level optimization models, to assess the vulnerability and plan the protection of critical infrastructure [8]. This modeling approach is taught to every OR graduate.

COMPARE, CONTRAST WITH CIVILIAN OR

Most courses in the OR curriculum cover topics similar to courses in civilian OR programs — computational methods, statistics, data analysis, stochastic models, linear and nonlinear optimization, network flows, simulation, decision analysis and game theory — but all of these are enriched with examples that relate to the students' experience and the professors' (and former students') research.

We also have courses and topics that are not commonly found in other programs. In direct response to the needs of the services that employ our graduates, these include campaign analysis, combat modeling, cost analysis, firing theory, human factors in system design, test and evaluation, search and detection theory and war-gaming. We even have an "OR by Excel" capstone course, very popular with students and our sponsors. (We think it is important to teach the more in-depth treatment of OR topics, before the student sees the spreadsheet versions.)

There is a great deal of emphasis in our courses on projects and presentations, because we know our students will need to be skilled in these activities on their jobs. For example, in our networks class, following the guidance of Professor Carlyle, students

form "Red Teams" that plan the optimal attack and defense of infrastructure systems (transportation networks, data communications, pipelines, power distribution networks, nuclear weapons development programs, etc.). Some of these projects have received attention at high levels in the government.

Many student and faculty projects have led to widely used products in the services. Professor Wayne Hughes' book *Fleet Tactics* [9] has been translated into numerous languages and is said to be in every wardroom afloat. Distinguished Professor Alan Washburn's collection of teaching materials on search and detection, Kalman filters, Lanchester equations and firing theory are widely used in the military OR world, as is his software for anti-submarine warfare.

The Marine Corps used an NPS network model for mobilizing officers [10]. A paper published in Operations Research in 2005 was recently developed into a system used for theater missile defense [11]. Capt. Jeff Kline, a former student and current faculty member, applied a simple linear program for conserving fuel when he was in command of a ship [12]. His ship's fuel usage was so much lower than her sister ships that Kline was inspected for safety violations. His performance was vindicated and the LP method was promulgated throughout the fleet. A total of eight master's of science theses have addressed various aspects of planning Tomahawk missile strikes from ships and submarines — this has culminated in the system the Navy now uses for this purpose.

New problems arrive almost every day. For example, Professor Gordon Bradley is in frequent contact with former students stationed in Iraq. They are trying ideas Bradley and his current students send back for dealing with improvised explosive devices. These officers are using generator power from forward bases, but they still respond moments after being contacted. We can exchange email and video with them at any level of classification. Thus, NPS-OR is part of a real-time, networked-OR military campaign. Tying this sort of experience into the OR education is a priceless opportunity for our students.

THE EXPERIENCE TOUR

A vital piece of the NPS-OR approach to education is what we call the experience tour. This is a six-week period at roughly the midpoint of the curriculum in which students go off campus to an organization where they can gain practical analytical experience. In most cases, the tour is tied to the student's eventual thesis topic, and is related to the faculty advisor's sponsored research. We fought over the years to retain the experience tour when various bean-counters have tried to find ways to cut the cost of the NPS-OR master's degree. As Distinguished Professor and Provost Emeritus David Schrady says, "The experience tour is essential because the laboratory of OR is the real world."

Our master's program lasts at least two years, and it is a terminal degree for more than 90 percent of our students. Depending on the student's background, a one-quarter engineering science and mathematics brushup can be added.

Current OR students at NPS include 21 international officers from 10 countries (Bahrain, Germany, Greece, Israel, Japan, Korea, Singapore, Spain, Taiwan and Turkey) and 144 U.S. officers from the Army, Navy, Marine Corps and Air Force. Our students learn much from their classmates' about their services, combat specialties and countries. Each year we start one cohort in the fall and another in the spring. The cohorts stay largely together, so strong friendships develop during classes, study sessions and after-hours socializing which bridge the military service and country differences. Each cohort has a section leader, so communication with the faculty is quick and effective.

NPS is very proud of a story that has been passed down like family lore for at least as long as I have been on the faculty (23 years). There was a skirmish in Cypress, which prompted Greece and Turkey to send warships to the area. The tension was rising. It looked like serious conflict could break out at any moment. A last-ditch effort at diplomacy was called for and representatives of both navies were gathered. Suddenly, two officers on opposite sides of the table recognized each other as fellow NPS students and began to reminisce. There was a dramatic change in the mood at that moment, and an international crisis was averted.

Several allied student-officers have gone on to great success in their services. The Chief Defense Scientist of Singapore, Pao Cheun Lui, is an NPS OR graduate, as is the recent Chief of Naval Operations for the Turkish Navy.

Admiral Mullen says this about his NPS-OR degree: "I think the OR curriculum I went through is very relevant to what we do in the Navy. I've used it in the Pentagon, at sea and in warfighting. What the curriculum taught me to do was properly frame a problem, ask the right questions, assess the risks and move on from there."

We are proud of our graduates!

Richard E. Rosenthal *(RRosenthal@nps.edu) is a professor in the Operations Research Department at the Naval Postgraduate School in Monterey, Calif. He has been on the NPS faculty since 1984 and served as department chairman from 1997-2000. He was the editor in chief of the journal Naval Research Logistics from 1988-2003 and currently serves as a vice president of INFORMS.*

Rosenthal has a passionate interest in the application of OR His research projects for the U.S. military have touched all branches and include studies of transportation, logistics, manpower and operations. He has also worked on civilian applications, most recently as a visiting senior scientist at Hewlett-Packard Labs. He is a winner of the INFORMS Award for the Teaching of Operations Research Practice (2000), a Fulbright Award (1981) and a National Academy of Sciences Senior Postdoctoral Research Award (1984), as well as the Koopman (1990), Barchi (1992) and Rist (1993 and 1997) prizes for military applications of operations research. He earned a B.A. in mathematical sciences from Johns Hopkins in 1972 and a Ph.D. in OR from Georgia Tech in 1975.

Clarity in the Fog of War

BY ROBERT KOYAK

Operations research as a whole benefits from having hard problems in data analysis and statistical inference engaged by those with expertise in these areas. Statistical analysis also benefits from treating problems as having more than a quantitative aspect. Data are more than a collection of numbers. Our students learn to view real-world problems as multidisciplinary, and to use all the skills at their disposal to handle them with integrity.

Because our master's students must complete a thesis in order to graduate, they quickly see the contrast between problems as presented in their textbooks (polished diamonds) and the subjects of their thesis research (diamonds-in-the-rough). The contrast can be disillusioning. I will use a current advisee as a case in point.

Maj. Matt Reuter, USMC, has assembled, with painstaking care a dataset consisting of the maintenance activity of 456 land vehicles (MTVRs) that have been fielded in Iraq. The maintenance records chronicle both scheduled and unscheduled maintenance events, and the dates upon which the vehicles were outfitted with armoring (which adds approximately five tons of weight to each vehicle). The sponsor wants to be informed about the operational reliability of these vehicles under field conditions in Operation Iraqi Freedom (OIF).

On the face of it, this project is a feast for a reliability modeler: it has a great story, real-world data, multiple failure modes (we are studying 11 of them), preventative maintenance events and interesting explanatory variables. Time to dig in, right? It would be, were it not for a few pesky details. For example, each data record is supposed to contain an odometer reading for the vehicle at the time of the maintenance event. Usage time is much better than chronological time for quantifying reliability, so we clearly want to have credible odometer readings.

Unfortunately, most of the odometer readings are either missing, given phony values such as "9999" or "12345," or constitute a schizophrenic profile when a vehicle is considered across time. Other serious data-quality problems exist as well. A RAND study noted that a 20 percent error rate is fairly typical for records in defense-related maintenance data bases, and what we have found suggests that this may be an understatement.

Many statistical modelers would choose to defer their feast for another day, but for my student the questions that must be answered would still remain. His thesis will describe data-quality shortfalls and how they impact his analysis, because these are things that his sponsor should know. He will tell them, for example, that the maintainers may be confusing the odometer with the tachometer, which are located side-by-side on the interior panel, and which may be causing the wild variations in recorded odometer readings that he observed. He will answer the important questions to the best of his ability, but with honesty about the uncertainty in his results due both to stochastic variability and to data-quality shortfalls.

Robert Koyak *is an associate professor in the OR Department at the Naval Postgraduate School in Monterey, Calif.*

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TITLE

Graduate Education and Employee Performance: Evidence from Military Personnel

AUTHORS

William R. Bowman
Department of Economics, US Naval Academy, Annapolis
Stephen L. Mehaya
Naval Postgraduate School, Department of Systems Management

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ABSTRACT: The authors examine job success of Navy officers and what factors affect it, and if the study's results affect the private sector. The authors focus on if officers with graduate degrees are more likely to be promoted, especially those with degrees from the Navy's sponsored, full-time program.

EXCERPTS:

"This paper examined the promotion probabilities of professional and technical Navy officers. Single-stage estimates indicate that, among those reviewed for up-or-out promotion to grade 4, promotion probabilities are 10-15 points higher for those with any graduate degree. For those with degrees obtained via the Navy's full-time funded program the differential ranges from 15 to 17 points."

"However, when instruments that are uncorrelated with promotion are used to predict graduate degree status, the results suggest that sizeable portion of the relationship between graduate education and promotion is due to unobserved attributes that lead some people to attend (to be selected for) graduate school, especially for the Navy's program, and to be more promotable. The selection-corrected are reduced by between 40 and 50%."

"The results in this paper cannot distinguish between these competing explanations of the observed relationship between graduate degrees and promotion. Nonetheless, it appears reasonable to conclude that graduate education in this organization works both directly by augmenting firm-specific skills and by providing a mechanism to sort individuals of greatest value to the organization. Individuals who are more career-oriented and who perform well within this organization signal these attributes via their willingness to attend graduate school and incur the additional costs. Among career-oriented individuals, the Navy selects those whose early performance indicates greater potential for jobs at the upper levels of the organization."

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Graduate Education and employee Performance: Evidence from Military Personnel

WILLIAM R. BOWMAN
DEPARTMENT OF ECONOMICS, US NAVAL ACADEMY, ANNAPOLIS, MD 21402, USA

STEPHEN L. MEHAY
NAVAL POSTGRADUATE SCHOOL, DEPARTMENT OF SYSTEMS MANAGEMENT, MONTEREY, CA 93943, USA

ABSTRACT

Few studies have examined the relationship between on-the-job productivity and graduate education using single-firm data. This paper studies the effect of graduate education on job performance using a unique micro-database consisting of military officers. Supervisor ratings and promotion probabilities are examined for professional and technical officers in the US Navy, a hierarchical organization with an internal labor market and up-or-out promotion policies. Single-stage estimates indicate that, among those eligible to be considered for promotion to grade 4, the up-or-out point, those with any graduate degree are more likely to be promoted. The effect is especially pronounced for those who receive a degree via the Navy's sponsored, full-time program. However, when instruments that are uncorrelated with promotion are used to predict graduate degree status, the results suggest that a sizeable portion of the relationship between graduate education and promotion is due to unobserved attributes that lead some people to attend (or to be selected for) graduate school and to be more promotable. The selection-corrected estimates of the promotion effect of graduate education are reduced by between 40 and 50%. [JEL I21, J24] Ó 1999 Elsevier Science Ltd. All rights reserved.

Keywords: Graduate education; Internal labor markets; Bivariate probit model; Promotion probabilities

1. INTRODUCTION

The earnings premium associated with postsecondary degrees (Grogger & Eide, 1995; Cohn & Hughes, 1994) is treated as the private return to education and is often interpreted as a reflection of the differential in productivity for those with more completed education. A considerable literature, however, has questioned whether the wage–schooling relationship is due to learning or to sorting by employers (Weiss, 1995). Aside from the difficulty of determining whether current wages measure productivity, a key issue in the debate is whether the link between education and productivity is causal in nature. Empirical studies using direct measures of productivity have produced inconsistent results. Indeed, the direct link between bachelor's and master's degrees and on-the-job productivity has not been studied extensively. Given the growing emphasis in the work force on formal education, additional research on the direct effect of postsecondary education appears warranted. This study examines the specific relationship between graduate education and on-the-job performance for professional employees in a single large, hierarchical organization.

The study examines the effect of graduate education on job success using a unique micro-database consisting of military officers. The data set contains relatively detailed information on promotion outcomes, performance ratings by supervisors, and numerous background characteristics such as aca-

demic achievement and early career performance in the organization. An advantage of the data set in exploring worker productivity is the organization's internal labor market characterized by a vertical hierarchy with a well-defined personnel system. Officer career paths are extremely structured: all officers begin their careers in entry-level positions and possess a bachelor's degree; those with master's degrees acquire them after joining the organization; and most advanced education is financed at least in part by the military and is viewed as a form of professional education.

The research should shed some light on the potential benefits of advanced education programs, for nearly all large private firms provide educational benefits to their professional and managerial employees.[1] In addition, the military's personnel system mimics private firms in many ways, so that studying military job performance may provide information on the operation of internal labor markets, including the promotion process and the role of performance evaluations.

The next section of the paper reviews previous studies that have dealt, directly or indirectly, with graduate education and job success. We then describe the personnel data used in the analyses, the Navy's advanced education programs, and the empirical strategy. Following that we present estimates of the performance models. In general, we find that graduate education improves measures of employee job productivity; however, these effects are significantly reduced in instrumental variable estimates that adjust for selection bias.

2. BACKGROUND

Only a handful of studies have analyzed the relationship between human capital and job performance using firm-level data. Wise (1975a, b) examined the starting salaries, salary growth, and promotion probabilities of managerial and professional employees in a single firm; Gerhart and Milkovich (1989) studied current salaries, salary growth, and the number of promotions over a 6-year period for exempt employees in a manufacturing firm. Wise found that those who acquired graduate degrees after joining the firm earned a 1.2 percentage point premium in annual salary growth, but only if they were ranked in the top third of their class. Promotion probabilities were about 7% higher for those with advanced degrees. Gerhart and Milkovich found that type of degree mattered: an M.A. had a negative effect on salary growth whereas an M.B.A. had a positive effect.

Medoff and Abraham (1980) argued that earnings should be compared only within grade levels due to differences in the type of jobs across grades. After controlling for grade level in their employee data from a manufacturing firm the earnings premium for a master's degree fell from 10 to only 1%. Moreover, while within grade earnings were higher for advanced degree holders, measured productivity was not. Because only one-tenth to one-fifth of the total return to education was due to higher within-grade earnings, they concluded that master's degree holders earn more simply because at entry they are assigned to jobs in higher grades. Introducing controls for performance evaluations in the earnings models did not move the education coefficients toward zero, implying that differences in performance for those with advanced degrees does not explain the positive within-grade relationship between education and earnings. They concluded that, within groups of comparable jobs, there was no correlation between additional human capital and performance.[2]

Woo (1986) also found that controlling for grade and performance rating reduced the earnings premium for a master's from 7–25 percentage points to only 1 point. Although salary growth rates for master's degrees exceeded those for bachelor's, Woo found an M.B.A had no effect on within-grade performance ratings, and a non-business degree had a negative effect. Further, the probability of promotion was significantly lower for both types of master's degrees. Since performance ratings and promotion are superior to earnings as measures of productivity, she concluded that a graduate degree does not enhance employee productivity.[3]

Several explanations have been offered for the find-

[1] A 1986 survey of Fortune 1000 companies revealed that 98% of the 730 respondents had a tuition assistance program. Two-thirds of the companies reimbursed employees for non job-related courses, especially if they were part of a degree program (O'Neill, 1986). Also, an increasing number of firms are setting up in-house 'corporate colleges'.

[2] This conclusion also applied to other human capital measures, namely pre-company experience and tenure at the firm, which were the primary focus of their papers. These basic results were echoed by Dunson (1985) who used data on federal professional and administrative workers.

[3] Bartel (1995) used a company database to estimate the effects of company-sponsored formal training for professional employees on wage growth and performance ratings. Using an instrumental variables strategy she found that the incidence and duration of formal training increased salary growth rates and performance ratings.

ing that earnings appear to increase with human capital variables, such as advanced degrees, but productivity does not. Weiss and Landau (1985) point out that the distribution of workers on a given job is truncated from above and below; truncation occurs because various criteria must be met initially to be assigned to the job and to keep it, and other criteria must be met (such as higher productivity) to get promoted. Hellerstein and Neumark (1995) note that the productivity indicators in these studies are occupation- and job-level-specific so that productivity and education are examined only for workers who remain in an occupation or a job. Such workers may be unrepresentative in the sense that they do not follow the normal life cycle pattern that involves occupational change and promotion.[4] Finally, Medoff and Abrahamtype studies examine salary and grade level after entry. If advanced degree holders start at higher grades, subsequent promotion opportunities will tend to be less numerous and to occur at longer time intervals.

These early studies also provide little information on the basic structure of the personnel systems of the firms studied. For example, performance measures are stratified by grade level but it is not known how workers are distributed across current or entry grades by education. Similarly, no information is provided on the firms' education programs, including the timing and source of funding of advanced education, the number of employees who benefitted from these programs and how they were selected, and the specificity of the investments. Finally, the analyses fail to discuss the eligibility of workers to be considered for promotion and promotion rates by grade. Without knowledge of a firm's career ladders, it is difficult to identify the pool of personnel eligible and qualified for promotion within a given grade. Consequently, promotion rates are likely to be mismeasured. In short, these studies do not attempt to integrate the structure of the firm, career paths and career ladders, or the promotion process into the analysis.

3. DATA AND ESTIMATION STRATEGY

The objective of this study is to examine job success for Navy officers. The study concentrates on promotion as the performance measure; however, information on supervisor evaluations is also used. The promotion model focuses on promotion to grade 4, which is the first significant control point in an officer's career and involves an up-or-out decision. All officers enter the military at grade 1 (ensign), and promotions to grade 2 (lieutenant j.g.) and grade 3 (lieutenant) are virtually automatic. Promotion to grade 3 occurs at 4 years of service; up-or-out review is at 10 years.[5] Most officers attend graduate school prior to grade 4, and the majority utilize the Navy's funded program.

The basic information is drawn from the Navy's Promotion History File, which provides background information on all officers reviewed for promotion between 1985 and 1990.[6] This file is augmented with supervisor evaluations (fitness reports) prior to the grade 4 promotion review. Officers are classified into two occupational categories—line and staff. Line specialists work in the primary operational areas of the Navy: aviation, ship operations, and submarine operations. Staff officers perform primarily administrative functions. Within each specialty the set of jobs performed, the level of difficulty of the jobs, and career paths are similar; also, supervisors' evaluations and promotion are based solely on performance within that specific community.[7] After deleting observations with missing data, the merged data file contains 4230 line and 2353 staff officers who were reviewed for promotion to grade 4 between 1985 and 1990.

The specification of the performance models recognizes the military's internal labor market, which is characterized by a vertical hierarchy, no lateral entry, administrative pay setting, and up-or-out promotion. The organization uses contests (or tournaments) to motivate work effort due to the cost of observing and monitoring individual effort (Lazear & Rosen, 1981). In a contest, the organization ranks

[4] A sizeable literature has also emerged that attempts to explain the broader puzzle of the positive relationship between experience and earnings versus the negative relationship between experience and productivity. Bishop (1987) discusses numerous reasons why the optimal wage-setting rule for a firm will result in wages that only partially adjust to measured differences in productivity. Hutchens (1989) points out that workers who remain in a given job grade for a long time do so because they have poor evaluations. Lazear (1981) argues that the use of implicit, delayed payment contracts makes it impossible to closely link earnings profiles with the time path of productivity. The various contract and other theories are summarized in Kotlikoff and Gokhale (1992).

[5] For a fuller description of military officer personnel systems, see Rand Corporation (1994).

[6] The data represent 'quasi-cohorts', a set of employees who enter a specific state, such as grade 3, over some period. These groups were reviewed for promotion to grade 4 between 1985 and 1990 and thus represent entry cohorts for 1976–1980. We concentrate on this period because it preceded the personnel turbulence associated with the military downsizing during the 1990s.

[7] Medical and legal specialities are excluded because officers in those fields often enter the Navy with master's degrees.

Table 1
Descriptive statistics by degree status and occupation[a]

	Line officers		Staff officers	
Variable	Master's	No master's	Master's	No master's
Promotion rate	0.86	0.76	0.84	0.70
Early performance[b] rating (%)	36.22	25.63	36.54	28.77
Technical B.A. (%)	0.65	0.67	0.43	0.57
Grade point average[c]	3.12	2.91	3.24	3.08
ROTC (%)	0.27	0.30	0.34	0.27
OCS (%)	0.25	0.26	0.34	0.42
NESEP (%)	0.07	0.07	0.20	0.13
Naval Academy (%)	0.41	0.37	0.12	0.18
Selective college (%)	0.51	0.55	0.65	0.67
Female (%)	0.02	0.01	0.22	0.18
Age	22.90	22.75	23.52	23.60
Married	0.24	0.25	0.19	0.19
Married with children (%)	0.56	0.51	0.54	0.49
Divorced with children (%)	0.01	0.01	0.01	0.03
Single (%)	0.19	0.23	0.26	0.29
Nonwhite	0.04	0.03	0.06	0.06
N	841	3389	858	1495

[a]Sample based on those reviewed for promotion at grade 4.
[b]Percent of supervisory evaluations that received an 'early promote' recommendation.
[c]Six-point scale: 0 = 0–1.89; 1 = 1.9–2.9; 2 = 2.2–2.59; 3 = 2.6–3.19; 4 = 3.2–3.59; 5 = 3.6–4.0.

Table 2
Probit promotion models for line officers

	Dependent variable = promotion to grade 4			
Variable	1.	2.	3.	4.
Master's degree	0.376	0.342	0.345	0.265
	(0.059)	(0.060)	(0.060)	(0.065)
	[0.098]	[0.087]	[0.085]	[0.065]
Female	0.710	0.628	0.636	0.502
	(0.244)	(0.246)	(0.246)	(0.249)
Age	− 0.064	− 0.064	− 0.074	− 0.071
	(0.010)	(0.010)	(0.015)	(0.016)
Married	0.191	0.188	0.186	0.137
	(0.064)	(0.064)	(0.064)	(0.069)
Married with children	0.260	0.257	0.255	0.252
	(0.057)	(0.057)	(0.057)	(0.062)
Divorced with children	0.014	0.037	0.035	0.006
	(0.164)	(0.165)	(0.165)	(0.179)
ROTC program	–	–	− 0.275	− 0.266
	–	–	(0.054)	(0.059)
OCS program	–	–	− 0.038	− 0.104
	–	–	(0.069)	(0.074)
NESEP program	–	–	− 0.095	− 0.124
	–	–	(0.119)	(0.130)
College GPA	–	0.183	0.175	0.142
	–	(0.027)	(0.027)	(0.030)
Technical B.A.	–	− 0.032	− 0.030	− 0.010
	–	(0.047)	(0.049)	(0.052)
Minority	− 0.227	− 0.164	− 0.181	− 0.103
	(0.106)	(0.106)	(0.107)	(0.115)
Early performance ratings	–	–	–	0.009
	–	–	–	(0.000)
Constant	1.947	1.439	1.781	1.598
− 2 Log *L*	4289.0	4242.9	4215.0	3590.2
N	4214	4214	4214	4039

Notes: Standard errors in parentheses; marginal effects in brackets. All specifications include fiscal year dummy variables.

workers based on evaluations and rewards them on the basis of relative (rather than absolute) performance. The contest determines who is promoted to the next higher rank (Rosen, 1992). Individual promotion probabilities also depend on the aggregate promotion rate to grade 4. The aggregate rate depends on the number of vacancies in the next higher grade at time *t*, which depends in turn on the number who survive into grade *i* at *t*, as well as on survival rates at all higher grades and years of service (Asch & Warner, 1994). Thus, an individual's promotion probability, π_{it}, in this type of organization depends on the aggregate promotion rate, π^*, the individual's own ability (a_i) and effort (e_i) and the abilities and work effort of all others in grade *i* at time *t*, (a_o,e_o); that is, $\pi_{it} = \pi_{it}\,(a_{it},e_{it},a_o,e_o,\pi^*)$.

Two important implications of hierarchical organizational forms are that the direct and indirect span of control increases geometrically with rank and that command decisions at higher ranks also have a publicness element. Individual productivity thus varies positively with rank and assignment policies must allocate the most capable individuals to the higher-ranking positions (Rosen, 1992). Promotion to grade 4 also effectively involves a tenure decision. The use of up-or-out underscores the length of reach of decisions at the next higher level, the potential cost of mis-assigning individuals with poor prospects to the upper ranks, and the importance of a tighter screening of individuals to those ranks (O'Flaherty & Siow, 1995).

4. ESTIMATES OF PROMOTION MODELS

The specification of the promotion model assumes that relative performance depends on accumulated human capital (Wise, 1975a, b; Bartel, 1995). Wise partitions human capital into cognitive skills and affective skills. The latter are based on work-related attitudes and attributes such as perseverance, self-discipline, leadership, initiative, and the ability to cooperate, which is especially important in the military's team production environment. In the empirical model below, cognitive abilities are specified as a function of college grade point average, a technical undergraduate degree in science, engineering or mathematics, or a graduate degree. Proxies for affective skills are based on accession source— the Naval Academy, an ROTC scholarship, Officer Candidate School (OCS), or the enlisted ranks. Naval Academy students effectively serve a 4 year apprenticeship before commissioning and thus may assimilate more easily into the military's team production environment.

Other demographic factors, such as gender and race are likely to be correlated with the accumulation of specific human capital, in part due to differences in occupational assignments. Women for many years were restricted from the line specialties, which offered the best chances for acquiring firm-specific capital. Minorities are also not represented equally in all occupational specialties, due in part to preferences and in part to academic background. These differences in assignments and associated opportunities for accumulating firm-specific human capital may affect promotability both across and within occupational specialty areas. Marital and family status are captured by four categories: married with no children; married with children; divorced with children; and single, the omitted category. Finally, the Navy promotes to fill vacancies so that promotion opportunities vary from year to year depending on cohort size (supply) and vacant slots in the next

highest grade (demand). Four fiscal year dummies are included to account for differences in each cohort's aggregate promotion opportunity (π^*).

The first analysis concentrates on job performance during the roughly 9 years prior to the up-or-out review. Information from supervisor evaluations (fitness reports) is used to construct a job performance measure. Even though the evaluation form contains numerous elements, most scores are highly inflated and there is little variation across individuals. However, one element for which there is significant variation and which has been identified as a valid measure of job performance is whether the officer is 'recommended for early promotion' (Neumann, Mattson & Abrahams, 1989). We use the percentage of all evaluations during the pre-up-or-out portion of one's career on which the officer received an early-promote recommendation as a measure of job performance. [8]

Table 1 displays descriptive statistics for key variables by officer specialty and degree status. About 18% of the officers reviewed for promotion to grade 4 possess an advanced degree. The unadjusted promotion differential favors those with a degree by 10 percentage points for line officers and by 14 points for staff officers. The proportion of early evaluations carrying the early-promote recommendation is 11–12 percentage points higher for those with M.A. degrees. For most other variables, differences in the means between those with and those without degrees appear slight due in part to the fact that the sample is restricted to officers whose academic background makes them eligible to attend graduate school.

We first estimate the probit promotion model under the assumption that graduate education is exogenous. The probit results for line officers appear in Table 2 and for staff officers in Table 3. Columns 1–4 of Tables 2 and 3 present alternative specifications of the promotion model to evaluate the sensitivity of the effect of graduate education to an increasingly inclusive set of controls. The estimated coefficients of any M.A. degree in Tables 2 and 3 have the expected signs and generally are statistically significant. Among the demographic variables, those who are female, younger, and married, with or without children, are more likely to be promoted. Minorities are less likely to be promoted, but the precision of this estimate falls in the fuller specifications in column 4. The promotion probability for Naval Academy graduates (the omitted category) is significantly higher than for the other accession sources, which supports the notion that Academy graduates enter the Navy with a greater stock of human capital and possibly affective skills.

The results appear to be robust to the different model specifications. In all specifications, the graduate degree coefficient is positive and significant. The marginal effect of an M.A. is 0.098 and 0.145 for line and staff officers, respectively, which is nearly the same as the unadjusted promotion differences in Table 1. Columns 2–4 reveal that the effect of graduate education is reduced as additional controls, some of which are likely to be correlated with an M.A., are included. The marginal effect falls to 0.057 in column 4 of Table 2 and to 0.089 in column 4 of Table 3, roughly a 40% drop compared to column 1 in both tables. Also, inclusion of the additional controls improves model fit, as the chi-square for the log likelihood ratio rises significantly from column 1 to column 4. A person with a higher GPA has a promotion probability that is about 5 percentage points higher than one with a lower GPA; having a technical undergraduate major makes no difference.

The specification of the single equation model is such that the coefficients of the education variables will be biased if the error term is correlated with the schooling choice. Individuals are assumed to base attendance at graduate school on the expected returns. The sponsored program imposes a cost in the form of an added military service obligation. Hence, those who accept funding view the benefits (in the form of higher promotion probabilities or better assignments) as exceeding the cost of the additional service time; those who reject the program probably do not expect to remain in the Navy owing to superior civilian employment opportunities. The coefficient of the M.A. will represent a bundling of pure education effects and differences in the motivation and career aspirations of individuals choosing to attend graduate school. In addition, it is likely that the organization uses information on job performance to select individuals for the funded program. The measured effect of funded education will be biased upward if the organization assigns more able persons to graduate school.

One technique for addressing the selection issue is to include controls in the models in Tables 2 and 3 for individual ability and the administrative criteria used to choose officers for the funded education

[8] The advantage of this variable is that it provides a cumulative record of performance and it covers performance for a variety of jobs and supervisors. Only a trivial proportion of officers are actually ever promoted 'early' (ahead of their peers in the cohort). Nonetheless, this recommendation on the evaluation signals that the supervisor views the employee's performance as superior to his peers. Interestingly, this element mirrors a question on the rating forms used by the private firm in the Medoff and Abraham (1980) study.

Table 3
Probit promotion models for staff officers

	Dependent variable = promotion to grade 4			
Variable	1.	2.	3.	4.
Master's degree	0.503	0.491	0.497	0.376
	(0.063)	(0.064)	(0.065)	(0.073)
	[0.145]	[0.141]	[0.136]	[0.089]
Female	0.161	0.141	0.181	0.160
	(0.085)	(0.086)	(0.088)	(0.097)
Age	− 0.036	− 0.037	− 0.036	− 0.036
	(0.011)	(0.011)	(0.016)	(0.018)
Married	0.314	0.319	0.308	0.227
	(0.093)	(0.093)	(0.093)	(0.104)
Married with children	0.201	0.205	0.185	0.106
	(0.079)	(0.079)	(0.080)	(0.089)
Divorced with children	0.107	0.112	0.107	0.163
	(0.184)	(0.184)	(0.185)	(0.224)
ROTC	–	–	− 0.271	− 0.155
	–	–	(0.091)	(0.103)
OCS	–	–	− 0.261	− 0.297
	–	–	(0.099)	(0.110)
NESEP	–	–	− 0.113	− 0.093
	–	–	(0.133)	(0.148)
GPA	–	0.079	0.084	0.108
	–	(0.034)	(0.034)	(0.039)
Technical B.A.	–	− 0.010	− 0.057	0.035
	–	(0.061)	(0.066)	(0.073)
Minority	− 0.246	− 0.219	− 0.236	− 0.069
	(0.113)	(0.114)	(0.114)	(0.129)
Early performance rating	–	–	–	0.014
	–	–	–	(0.001)
Constant	1.135	0.913	1.115	0.633
− 2 Log *L*	2502.3	2495.9	2485.5	1918.9
N	2349	2349	2349	2201

Notes: See Table 2.

program. The two most important selection criteria are academic background and early career performance, attributes which are proxied by college GPA and early performance ratings. College GPA will also index one's cognitive abilities. When these controls are included in Tables 2 and 3, the coefficient of the M.A. drops by about 20% (compare columns 2 and 4 to column 1 in both Table 2 and Table 3).

The above approach attempts to deal with the selection problem by conditioning explicitly on factors likely to be correlated with ability and the likelihood of attending graduate school. Even though these proxies have considerable explanatory power, they may fail to fully capture individual ability and educational preferences. If so, the disturbance term in the model will include the portion of each person's preferences for education not captured by the proxy variables, which may be correlated with the actual possession of a graduate degree. Our second approach is to address this issue using the following bivariate probit model:

$$Y_i = x_i\beta + I_{Gi}\gamma + \varepsilon_{\gamma i} \quad (1)$$

$$G_i = Z_i\alpha + \varepsilon_{Gi} \quad (2)$$

where I_{Gi} is an indicator variable equal to 1 if the individual attends graduate school and equal to 0 otherwise; Y_i is the latent value of being promoted; G_i is the latent value of completing graduate school; x_i is a set of individual characteristics and Z_i includes some of the characteristics in x plus a set of instruments for graduate school completion. We observe that $I_{yi} = 1$ if $\gamma_i > 0$ and $I_{yi} = 0$ if $\gamma_i < 0$; we observe that $I_{Gi} = 1$ if $G_i > 0$ and $I_{Gi} = 0$ if $G_i < 0$. We assume that both ε_γ and ε_G are mean zero, given x and Z and that they are distributed bivariate standard normal.

To obtain the instruments we first estimate a probit model of the determinants of graduate school attendance, which assumes that attendance is based on expected returns and individual characteristics such as sex, age, marital status, and race/ethnicity. The cost of attending graduate school varies across occupational specialties. This is because in some specialties the career path allows little time for leaving the operational environment, so that there is a significant opportunity cost from attending graduate school. In other specialties, the opportunity cost of attending graduate school is high due to strong civilian career opportunities. Thus, the selection model includes dummy variables to control for subspecialities within the line and staff occupations.

Costs and benefits will also vary across individuals within a subspecialty owing to one's relative position and long-term career interests. A proxy variable is available which indexes the individual's (perceived) position. Officers must keep placement officials informed about career intentions, including whether they will attend graduate school if the program is offered to them. These preferences are recorded in the data file. A positive stated preference for graduate school provides a gauge of the individual's evaluation of the value of graduate education. Moreover, this preference variable should be strongly correlated with attendance at graduate school but not with promotion outcomes. Finally, based on the administrative criteria for selection, the graduate school model includes proxies for the likelihood of being selected for the graduate education program. These include academic preparation (college GPA) and performance in college mathematics and science courses. Since superior performance as a junior officer is also an important selection criterion, the supervisor evaluations variable is included as a proxy for early-career performance. The system is identified if at least one variable in the selection equation is omitted from the structural equation. The occupational dummies, the preference variable, and the college performance variables (other than GPA) serve as the identifying instruments in this case.[9]

[9] A joint test, based on the likelihood ratios from alternative model specifications, supported the choice of exclusion restrictions.

The probit selection model results are displayed in the table given in Appendix A. For line officers, the coefficients of college math and science background and early performance ratings are all positive and significant in the model. Early career evaluations have a direct effect on promotion as well as an indirect effect operating through graduate school selection. Individuals from the line specialties hypothesized to have the highest cost of attending graduate school (submarine, aviation, and other line) are less likely to enter the sponsored program. Finally, the preference variable is strongly positively correlated with the decision to undertake advanced education. For staff officers in column 2 the relationships are similar except that the subspecialty dummies are insignificant.

Column 3a of Table 4 presents the estimated effect of any M.A. degree in the bivariate probit model. For comparison purposes, the single-stage results with and without controls for ability and early-career performance are reproduced in columns 1 and 2, respectively. The bivariate probit model provides evidence that a large part of the promotion effects in the single-stage models are explained by the selection of more able officers into the graduate education program. The estimated error covariance in column 3b is positive and significant and the coefficient of the M.A. is smaller in the bivariate probit model (compared to single-stage estimates in column 2). The extent of positive selection appears to differ substantially between the two broad occupational fields. For line officers, the coefficient of the M.A. in the bivariate probit model is about 25% smaller than in the single-stage model that included controls for ability and performance (column 2). For staff officers, the effect of an M.A. falls by 50% and the coefficient is significant at only the 0.10 level. In general, the bivariate probit results indicate that the controls for ability and performance in the single equation probit (in column 2) do not fully capture the selection process.[10]

Of the officers with graduate degrees, the majority (75.1% of line officers and 70.8% of staff officers) received them via the Navy's funded program, which pays tuition and salary during attendance at graduate school. Since the funded programs tend to involve more firm-specific training than civilian programs, a question arises as to whether the return to an M.A. reflects a return to general or specific investments. We test this hypothesis by omitting non-funded M.A.s from the sample and comparing individuals with an M.A. from a funded program to individuals without degrees. Table 5 displays the estimated coefficients of the funded M.A. variable. In the single-stage models the return to a funded M.A. for line personnel is nearly double what it is for any M.A. in Table 4, and for staff personnel the return is about 20% higher. However, the bivariate probit results in Table 5 also highlight the greater positive selection for funded degrees than for all degrees in Table 4. Whereas positive selection reduced the return to any M.A. by about one-third for line officers in Table 4, positive selection appears to reduce the return for funded degrees by nearly one-half in Table 5. For staff officers, the return to any M.A. is reduced by two-thirds in the IV estimates in Table 4, but the return to a funded M.A. is reduced by nearly three-quarters in the IV estimates in Table 5. Thus, it appears that both firm specific and general types of investments yield a positive return to employees in this organization.

Table 4
Coefficient of any master's degree in single stage and bivariate probit models

	1. No controls for ability/performance	2. Controls for ability/performance	3.a. Bivariate probit	3.b. Error covariance (ρ)
Line officers	0.376	0.265	0.198	0.124
	(0.073)[a]	(0.065)	(0.077)	(0.033)
	[0.098][b]	[0.065]	[0.056]	–
Staff officers	0.503	0.376	0.188	0.170
	(0.063)	(0.073)	(0.108)	(0.039)
	[0.145]	[0.089]	[0.051]	–

[a]Standard errors in parentheses.
[b]Marginal effects in brackets.

5. CONCLUSIONS

This paper examined the promotion probabilities of professional and technical Navy officers. Single-stage estimates indicate that, among those reviewed for up-or out promotion to grade 4, promotion probabilities are 10–15 points higher for those with any graduate degree. For those with degrees obtained via the Navy's full-time funded program the differential ranges from 15 to 17 points. However, when instruments that are uncorrelated with promotion are used to predict graduate degree status, the results suggest that a sizeable portion of the relationship between graduate education and promotion is due to unobserved attributes that lead some people to attend (or be selected for) graduate school, especially for the Navy's program, and to be more promotable. The selection-corrected estimates of the promotion effect of graduate education are reduced by between 40 and 50%.

An important issue is whether the effect of graduate

[10] To conserve space only the coefficients of the M.A. variable are presented. Changes in the size of the coefficients of the other control variables in the models are slight between the single stage and bivariate probit estimates.

degrees observed here reflects enhancement of the officer's on-the-job productivity or sorting by the firm. At first glance one might reject the sorting argument because the information costs that generate the need for signaling are not as relevant here as they are in the labor market where employers must assess applicants for entry level jobs. Rather, this is a personnel system in which employees have worked for 6 or more years before being selected for graduate education, and 10 years before being reviewed for promotion to grade 4. In the tournament model the firm is assumed to observe productivity and there is no role for signaling. Nonetheless, screening may still be valuable to the organization in this situation because upper levels in the hierarchy require different skills and greater ability than lower levels. Moreover, it is difficult for the organization to observe true ability and this information problem is not entirely solved by observing performance at the lower levels because the difference in the skills required in lower and upper level jobs is so great.

The results in this paper cannot distinguish between these competing explanations of the observed relationship between graduate degrees and promotion. Nonetheless, it appears reasonable to conclude that graduate education in this organization works both directly by augmenting firm-specific skills and by providing a mechanism to sort individuals of greatest value to the organization. Individuals who are more career-oriented and who perform well within this organization signal these attributes via their willingness to attend graduate school and incur the additional costs. Among career-oriented individuals, the Navy selects those whose early performance indicates greater potential for jobs at the upper levels of the organization.

A final issue is whether these results would generalize to the private sector. Recent research suggests that, except for the up-or-out policy, employment systems of private firms share key features with the Navy's hierarchical system. Analyses of the hierarchical structure of managerial jobs in a major private firm have identified the following features identical to the Navy's system: the firm has eight hierarchical levels; the average tenure in the lowest three grades is between 3 and 4 years; grade level 4 is a crucial choke point for career advancement; and upper level jobs in the firm (above grade 4) are characterized as pertaining to general management, managing larger groups, coordinating across units, or strategic planning (Baker, Gibbs & Holmstrom, 1994a; Baker, Gibbs & Holmstrom, 1994b).

Especially important are the similar patterns of outcomes observed in private firms and the Navy. Baker et al. (1994a,b) confirm that private firms promote only those with the best relative performance and Bartel (1995) finds that firms select employees for companysponsored training on the basis of their early on-the-job performance and that the measured productivity of employees receiving sponsored training exceeds that of managerial employees not receiving the formal training. In addition, the selection corrected effect of a master's degree acquired after joining the organization on the probability of promotion in this study is nearly identical to that obtained by Wise's study of white collar workers in a large corporation. These similarities suggest that the positive relationship between human capital investment and on-the-job performance observed here may generalize to civilian firms.

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We thank Barry Hirsch, John Warner, participants at the University of Maryland Economics Seminar, and two anonymous referees for helpful comments. Melissa Potter provided research assistance. Stephen Mehay thanks the Hoover Institution at Stanford University where he was a visiting scholar during this research. The views expressed are solely those of the authors. Funding was provided by the Navy Personnel Research and Development Center.

Appendix A

Table 6
Bivariate probit estimates of graduate school attendance

Variable	Line officers	Staff officers
Early performance rating	0.0028	0.0033
	(0.0005)	(0.0007)
Preference	0.400	0.153
	(0.046)	(0.053)
Math background	0.402	0.179
	(0.074)	(0.073)
Science background	0.104	0.356
	(0.058)	(0.054)
Submarine specialty	− 0.429	–
	(0.073)	–
Aviation specialty	− 0.271	–
	(0.048)	–
ROTC program	− 0.095	− 0.167
	(0.056)	(0.101)
OCS program	− 0.166	− 0.096
	(0.067)	(0.102)
NESEP program	− 0.263	0.119
	(0.120)	(0.128)
College GPA	0.212	0.129
	(0.025)	(0.031)
Technical B.A.	− 0.008	0.348
	(0.052)	(0.069)
Female	0.131	0.368
	(0.180)	(0.111)
Age	0.023	− 0.011
	(0.012)	(0.012)
Nonwhite	− 0.027	0.089
	(0.107)	(0.111))
Married	0.013	0.049
	(0.065)	(0.085)
Married with children	0.079	0.134
	(0.057)	(0.074)
Divorced with children	− 0.049	− 0.170
	(0.179)	(0.176)
General line community	–	0.136
	–	(0.116)
Restricted line community	–	0.101
	–	(0.070)
Constant	− 2.326	− 1.232

Notes: Standard errors in parentheses.

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TITLE

Return on Investment in Navy Graduate Education

AUTHORS

William R. Bowman, USNA
Stephen L. Mehay, NPS
Slide Presentation, Department of the Navy

ABSTRACT

Applying accepted economic principles to estimate the monetary values of the Naval Postgraduate School program's benefits and costs, this slide presentation uses data on Surface Warfare Officers to estimate the costs and benefits of the following graduate education alternatives: fully-funded degree, off-duty degree, and no degree.

EXCERPTS

"Fully-funded program costs = $66.8m. Include direct and indirect costs of NPS (or tuition at CIVINS). Include student salaries."

"Off-duty program costs include tuition assistance costs ($14.5m); account for TA costs by deducting from funded program costs in the program comparisons: ▸($66.8m - $14.5m = $52.3m)."

"Funded program has large net retention benefits compared to no degree. However, net retention benefits of funded program are small compared to off-duty program."

"Retention and promotion differences (by degree status) yield estimates of steady-state accessions needed to produce one 'career' officer (=CAPT)."

"Increased retention reduces accessions and pre-commissioning costs. These accession costs avoided represent the retention benefits of the program with the higher retention."

CD REF NO. PW–33

Return on Investment in Navy Graduate Education

WILLIAM R. BOWMAN, USNA
STEPHEN L. MEHAY, NPS

ANALYSIS OF ROI FOR GRADUATE EDUCATION

OBJECTIVE: Estimate costs and benefits of three graduate education alternatives:

- Fully-Funded Degree
- Off-Duty Degree
- No Degree

METHOD: Apply accepted economic principles to estimate monetary values of program benefits and costs[2]

DATA: Use data on Surface Warfare Officers

RETENTION ANALYSIS

Analyze data on career progression of SWOs from LT through CAPT

Simulate retention and promotion of SWO's by M.A. degree status:

- Fully-funded degree
- Off-duty degree
- No degree

Retention and promotion differences (by degree status) yield estimates of steady-state accessions needed to produce one 'career' officer (=CAPT)

Increased retention reduces accessions and pre-commissioning costs

- These accession costs avoided represent the retention benefits of the program with the higher retention

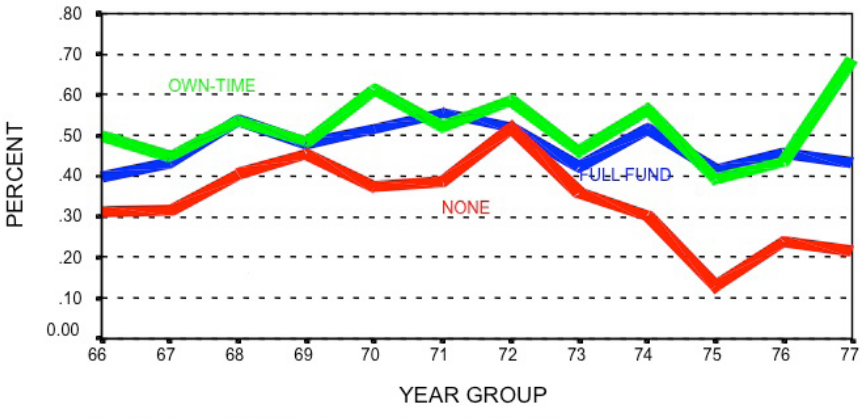
DATA

- BUPERS Promotion History Files
- Year groups: 1977-1989
- Data covers all promotion boards, 1981-2000

TAXONOMY OF POTENTIAL BENEFITS OF GRADUATE EDUCATION

Program Outcomes	Benefits to Navy	Monetary Value
I. ***Increased retention***	✓ Reduced accessions	✓ Reduced accession costs and post-accession training costs; ✓ Reduced bonuses; ✓ Reduced salaries.
II. ***Increased labor productivity*** • In subspecialty billets; in other billets	✓ Increased individual or unit performance ✓ Reduced manpower	✓ Reduced labor costs.
III. ***Implement technology***	✓ Increased unit output/ readiness	✓ Reduced equipment costs; increased productivity
IV. ***Increased unit productivity***	✓ Increased unit output/ readiness ✓ Reduced manpower	✓ Reduced manpower costs
V. ***Faculty/Student Research output***	✓ Research projects/reports	✓ Improved operations; ✓ Reduced operation costs; ✓ Reduced contract research costs.
VI. ***Increased QOL; improved job and overall satisfaction***	✓ Increased retention (indirect retention effect)	✓ Reduced accession and bonus costs

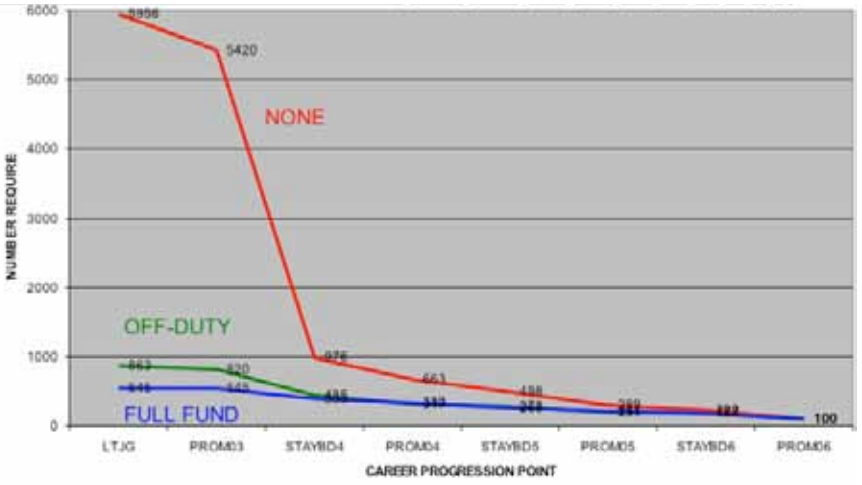
SWO O6 "YIELD RATES" BY GRADUATE DEGREE



Yield Rate=Percent of CDRs who stay and promote to Captain.

AVERAGE SWO CAREER PROGRESSION BY GRADUATE DEGREE STATUS: FY1986-1999

SIMULATED NUMBERS OF SURFACE WARFARE OFFICERS TO YIELD 100 CAPTAINS BY GRADUATE DEGREE STATUS



(N=33,000+)

- Represents quasi-longitudinal data

MONETARY VALUE OF RETENTION BENEFITS

- Accessions saved
  = (required accessions via off-duty program) - (required accessions via funded program)

- Costs avoided =
  Σi {(accessions saved) x (commissioning costs per accessioni)}

where, i = commission source (USNA, NROTC, OCS)

MARGINAL COSTS OF FUNDED PROGRAM

Fully funded program costs = $66.8m

- Include direct and indirect costs of NPS (or tuition at CIVINS)
- Include student salaries

Off-duty program costs include tuition assistance costs ($14.5m); account for TA costs by deducting from funded program costs in the program comparisons:

- ($66.8m - $14.5m = $52.3m)

SUMMARY: NET RETENTION BENEFITS

- Funded program has large net retention benefits compared to no degree
- However, net retention benefits of funded program are small compared to off duty program

VALUE OF RETENTION BENEFITS

Program	(1) Difference in accessions	(2) *BENEFITS: Accession Costs Avoided*	(3) COSTS: Funded Graduate Education Program	(4) Net Benefits= (2)-(3)	(5) ROI= (4)/(3) x 100
Funded Grad. Education	———	***BASE***	**LINE**	———	
No Grad. Educ.	+5,411	*$925.8 mil.*			
Off Duty Degree	+318	*$54.2 mil.*			

NET RETENTION BENEFITS (OF FUNDED PROGRAM)

Program	(1) Difference in accessions	(2) BENEFITS: Accession Costs Avoided	(3) COSTS: Funded Program	*(4) Net Benefits= (2)-(3)*	(5) ROI= (4)/(3) x 100
Funded vs. no graduate educ.	+5,411	$925.8 mil.	$66.8 mil.	*+$859 mil.*	1208%
Funded vs. off duty educ.	+318	$54.2 mil.	$52.3 mil. (net of TA costs)	*+$1.9 mil.*	3.6%

TITLE Letter from Assistant Secretary of Defense for Research and Engineering for Department of Defense Zachary Lemnios to NPS President Dan Oliver

CD REF NO. PW–34

Dan,

Thanks again for the opportunity to come out to NPS and participate in the SecNav Lecture series. It was great to see you and to spend time with the students and professors. You are leading a remarkable institution that is front and center on training the Department's future leaders.

I also had an opportunity to visit Camp Roberts Tactical Network Testbed (TNT). This is a remarkable site and a unique venue for warfighters, technical experts and the industrial base to investigate real needs. Ray Buettner and his crew are doing vital work. As we discussed, there are several technical challenges with networks and helicopters where I gained some insight via TNT. I will encourage Dr. Carter to spend some time at an upcoming session and reinforce SOCOM's role when I next visit the command.

Regards,
Zach

TITLE

Evaluating Navy's Funded Graduate Education Program

CD REF NO. PW–35

AUTHORS Kristy N. Kamarck, Harry J. Thie, Marisa Adelson, Heather Krull

Evaluating Navy's Funded Graduate Education Program
A Return-on-Investment Framework

KRISTY N. KAMARCK, HARRY J. THIE,
MARISA ADELSON, HEATHER KRULL

PREFACE

The military services send substantial numbers of their officers to graduate school. The cost of a graduate school billet, coupled with the cost of the schooling itself, imposes a considerable financial burden on the services. Therefore, they are interested to know whether the return on their investment warrants the cost of the education. The RAND National Defense Research Institute (NDRI) was asked to conduct an assessment of the quantitative and qualitative returns on investment (ROIs) for funded graduate education for naval officers. This monograph reviews the evolution of Department of Defense (DoD) and U.S. Navy policy with respect to funded graduate education and the metrics used to evaluate Navy graduate education programs and those within the other services. The document provides an ROI framework for evaluating the benefits and costs of providing funded graduate education. The authors presume some knowledge of the terminology associated with officer management, education evaluation, and ROI. The monograph should interest the military manpower, personnel, training, and education community. Comments are welcome and may be sent to Harry_Thie@rand.org.

This research was sponsored by the Navy and conducted within the Forces and Resources Policy Center of the RAND National Defense Research Institute, a federally-funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, the Unified Combatant Commands, the Navy, the Marine Corps, the defense agencies, and the defense intelligence community.

For more information on RAND's Forces and Resources Policy Center, contact the Director, James Hosek. He can be reached by email at James_Hosek@rand.org; by phone at 310-393-0411, extension 7183; or by mail at the RAND Corporation, 1776 Main Street, P.O. Box 2138, Santa Monica, California 90407-2138. More information about RAND is available at www.rand.org.

SUMMARY

Background, Purpose, and Approach

The U.S. Navy and the other military services send a number of their officers to graduate-level institutions each year to obtain advanced degrees. The primary purpose of providing these officers graduate education is so they can fill positions in their services whose duties require the knowledge and skills gained in graduate school. Furthermore, the benefits of a graduate education extend beyond the specific assignment for which the officer was educated, applying to subsequent assignments as well, albeit less directly. However, at an estimated cost of about $245,000 per officer for a funded master's degree, the cost of this education is substantial. For fully-funded education, the service must pay not only the cost of the education but also the pay and allowances associated with an officer's billet allocated for education. Additionally, an opportunity cost is incurred: While the officer is attending school, his or her services are lost to the operational billets in which he or she could be gaining experience. The question frequently arises as to whether the benefit gained from a graduate education is worth the cost. While the quantitative effects of graduate education can be estimated, evaluating the qualitative effects of a graduate education poses a number of challenges.

The Navy asked NDRI to assess the quantitative and qualitative ROI for funded graduate education. The NDRI research team reviewed the educational policies of DoD and the Navy, compared the Navy's programs and metrics with those of the other services, and did a detailed analysis of two officer communities within the Navy: surface warfare and meteorology and oceanography.

Findings

Key findings from the research include the following:

- **DoD educational policy suggests broader and more extensive use of graduate education than simply filling billets that have been determined to require it.** The new DoD policy speaks to educating military personnel for "future capabilities." While the Navy's most recent policy guidance on graduate education governance appears to accord with the DoD policy, it is not clear that this broader view has permeated the Navy's educational community. The Navy's system for managing graduate education and the metrics it uses to evaluate the performance of that system tend to focus on filling validated billets—that is, it manages to meet present needs, not to build future capabilities.

- **Graduate education provides both technical skills and nontechnical competencies or "soft skills," which are valued in a wide range of Navy billets beyond those that require graduate education.** The Navy realizes additional value through improved officer productivity, better decision making, and increased retention. Additionally, in certain billets, competencies gained in graduate education may compensate for lack of domain knowledge.

- Cross-service differences exist in graduate education philosophy; program parameters; utilization rates; and, particularly, program management. The Navy has one of the largest requirements for graduate education in terms of annual quotas and validated billets. It has 550 annual quotas to fill some 4,800 billets, compared with the Air Force's 460 quotas and the Marine Corps' 180 quotas for far fewer billets each.[1] It also has the lowest utilization rates for officers with graduate education among all the services. The Navy's average career utilization rate for non–staff corps officers is about 50 percent, compared with the Air Force's nearly 60 percent within one tour following graduation and the Marine Corps' 96 percent. Moreover, even if the Navy achieved better utilization rates, there is still a mismatch between validated billets and graduate school quotas in the Navy.

- **Differences exist among Navy communities in the management of officers and billets that require graduate education, particularly between the restricted line and unrestricted line communities.** The restricted line has proportionally more billet requirements, more-frequent utilization, and more-frequent reutilization than the unrestricted line community. Cultural influences and career demands within the unrestricted line often impede demand for graduate school and service in validated billets.

- Education execution, billet execution, and officer management execution are decentralized, and incentives and penalties for billet and quota management are not integrated. Community managers and education program managers often have different goals and metrics for assessing program success. Community managers focus on operational issues and gauge their success by how well they fill all the billets in the fleet. Education managers focus on filling graduate school quotas with qualified officers and on placing officers with the proper educational credentials in validated billets. At times these goals clash, with the result being unfilled billets or billets filled by individuals who do not have the requisite experience or qualifications.

- **The overall benefits in terms of ROI to the Navy from graduate education can be measured, given certain assumptions.** Although assessing the qualitative effects of graduate education poses some challenges, it is possible to make some reasonable assumptions about the costs and benefits of a graduate education. Our approach presents a way to ascertain the costs and some assumptions to determine benefits. These parameters can be adjusted in the model to identify elements that are particularly sensitive. An order-of-magnitude estimate is quite feasible, and more precise assessment would be possible with better data.

- **The current metric, which specifies one utilization per career for each educated officer as specified in the DoD and Navy instructions, will not give the Navy a break-even ROI within a 20-year career, given our assumptions.**

[10] In Navy terminology, quota refers to an individual billet for a training or education course. Navy program managers control a discrete number of quotas for each program, which they can allocate to individuals. Typically, the individual's command will request a quota for a specific program, and the program manager will either approve or disapprove the request.

- Recouping the investment in graduate education expenses based on skills gained requires long service by officers in billets requiring the graduate education (multiple utilization tours) and even longer service in other billets.

Recommendations

In light of our findings, we have divided our recommendations into three areas: policy, culture, and monitoring and evaluation.

Policy

To bring Navy educational practices more in line with DoD policy to shift graduate education toward development of future capabilities, the Navy needs to introduce a top-down approach to replace the bottom up one it now employs. This shift would include reviewing existing graduate education instructions to verify that the language and intent square with current DoD policy. Navy policymakers should consider the intent of DoD policy (DoD Instruction 1322.10), revised in April 2008, that "Knowledge is good, and more is preferable." Once this policy language is clear, Navy leaders need to communicate their graduate education policy to graduate education program managers, community managers, and officers.

Justifying the cost of graduate education requires extremely long service. However, the value of graduate education might be perceived to lie in the increasing productivity and decision quality that its soft skills and general knowledge provide. If so, the education may be considered a cost of doing business to achieve future capabilities. Moreover, if developing future capabilities is the program goal, it seems justifiable to make graduate education a competitive selection for those most likely to stay in the service and advance to flag rank. In essence, the Navy would be broadly educating many to achieve future capabilities and an ROI from the few.

Culture

Increasing emphasis on graduate education as a benefit to the community and to the Navy-at-large will require a cultural shift for some Navy communities to overcome negative perceptions about career "breaks" for education and utilization assignments. In line with a top-down approach, community leaders should set goals for graduate education attainment. One example might be "90 percent of all officers advancing at the O-5 board will have a graduate degree." In tandem, community leaders need to develop goals for the types of graduate degree curricula that would support their anticipated capability requirements beyond their current validated billet requirements.

The Navy can take some tactical steps to improve their utilization efficiency immediately by increasing utilization rates and reutilizing officers with advanced degrees, thus increasing net quantitative ROIs. The Navy should provide incentives for more-integrated management of officer assignments at the community level and also institute penalties for poor management of billets, quotas, and officers.[2] These should vary by community to reflect differences in billet structures and operational requirements. Community leaders should also seek to provide incentives for completing graduate educations and serving in validated billets to increase economic returns on their education investments. The Navy should consider the approach the Air Force uses, which includes master's degrees in promotion decisions. Additionally, because officers who serve in subsequent assignments that require graduate degrees increase the Navy's net benefit in terms of ROI, promotion boards and other incentive initiatives should give exceptional weight to those who have both an advanced degree and practical experience in a given field.

Monitoring and Evaluation

The Navy should expand its utilization metric and enhance monitoring and evaluation of its graduate education program. The one-tour utilization metric needs to take into account additional benefits to the Navy that officers with graduate education offer. In particular, using these officers in billets not coded as requiring a graduate degree may offer value that graduate education program managers are not currently capturing. Better data collection and periodic evaluations of graduate education programs under a hierarchy of outcomes would assist in identifying this value.

Conclusion

The Navy possesses the necessary mix of institutions and curricula in its funded graduate education program to meet its present capability requirements. However, the metric of one utilization tour, as defined in current Navy policy, is not capturing the total value of graduate education to the Navy. In fact, given the current graduate school timing and career progression for most officers, one utilization tour per educated officer does not recoup the cost of educating that officer within a 20-year career. Our research and analysis indicate that the knowledge and skills gained through graduate education are valuable for both the officer and for the Navy. The value

[2] One option for penalizing poor management would be a loss of graduate education quotas for communities that fail to meet certain threshold utilization rates for officers in validated billets.

for the Navy lies in improved productivity, better decision making, and increased retention. Some of this value can be monetized, and costs and benefits to the Navy can be estimated using enhanced data-collection methods and reasonable assumptions. Recent shifts in DoD policy language and intent suggest that the Navy should expand on the one-tour utilization metric to establish a more-nuanced assessment of the value of graduate education for the Navy's officer corps, especially with respect to future capabilities.

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This research benefited from the input of manpower and education experts from each of the services who talked with us and shared valuable data and insights. We take responsibility for the analysis herein but also appreciate the collaboration and support of LCDR Claude McRoberts, CAPT Karen Emmel, CDR Darin Evenson, CAPT John Coronado, CDR Rob Tortora, CAPT Richard Moyer, LCDR Joseph Scott, LCDR Bart Fabacher, and LCDR Bradley Andros, USN; Maj. Bradley Ward, USMC; Scott Lutterloh, Vicki Poindexter, Marilyn Augustine, Steve Muir, and Richard Linton, OPNAV N15; William Hatch, NPS; Roelene Freeman, USA HRC; and Maj Ann Igl and Capt Michael Sukach, USAF. We are also grateful for the support of CDR Richard Haberlin, CAPT Eric Kaniut, LCDR Scott Snyder, CAPT Karen Schriver, Arthur Barber, and Linda Lester from our sponsoring office.

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ABBREVIATIONS AND GLOSSARY

AAD	advanced academic degree
ADSO	active-duty service obligation
AFIT	Air Force Institute of Technology
AMOS	additional military occupational specialty
BUPERS	Bureau of Naval Personnel
CIVINS	civilian institution
DoD	Department of Defense
DoDI	Department of Defense instruction
IGE	immediate graduate education
MA	master of arts
MAcc	master of accounting
MBA	master of business administration
MCO	Marine Corps order
METOC	meteorology and oceanography
MOS	military occupational specialty
MS	master of science
NDRI	National Defense Research Institute
NPS	Naval Postgraduate School
NWC	Naval War College
O-1	ensign (Navy), second lieutenant (Air Force, Army, Marine Corps)
O-2	lieutenant, junior grade (Navy), first lieutenant (Air Force, Army, Marine Corps)
O-3	lieutenant (Navy), captain (Air Force, Army, Marine Corps)
O-4	lieutenant commander (Navy), major (Air Force, Army, Marine Corps)
O-5	commander (Navy), lieutenant colonel (Air Force, Army, Marine Corps)
O-6	captain (Navy), colonel (Air Force, Army, Marine Corps)
OPNAV	Office of the Chief of Naval Operations
OPNAVINST	Office of the Chief of Naval Operations instruction
P code	code designating an officer having a funded master's degree and a billet requiring such an officer
pol-mil	political-military
Q code	code designating an officer holding a funded master's degree plus experience in the relevant subspecialty and a billet requiring such an officer
quota	in Navy terminology, an individual billet for a training or education course
R code	code designating an officer holding a doctorate
RL	restricted line
ROI	return on investment
ROTC	Reserve Officer Training Corps
SEP	special education program
STA-21	Seaman to Admiral-21 Program
SWO	surface warfare officer
URL	unrestricted line
USNA	United States Naval Academy
VGEP	Voluntary Graduate Education Program
YOS	years of service

CHAPTER ONE
INTRODUCTION

The U.S. Navy and the other military services provide training and education as part of their officer development programs. For the Navy, this model includes opportunities to gain knowledge and skills in a graduate school and apply them to various assignments at sea and ashore. The Navy funds graduate education with the expectation that the officers chosen to receive it will go on to apply the knowledge and skills they acquire in billets (positions) for which that education is a prerequisite. The officers selected for this education are typically in grade O-3 (lieutenant) and will use their education starting in grade O-4 (lieutenant commander) and continuing throughout their careers.

Purpose

The RAND National Defense Research Institute was asked to assess qualitative and quantitative measures for return on investment (ROI) for funded officer graduate education. While Navy graduate education is a combination of fully-funded, partially-funded, and unfunded programs, our focus was on funded programs at the Naval Postgraduate School (NPS), at the Air Force Institute of Technology (AFIT), and at civilian graduate institutions. Our review did not include graduate programs provided at institutions that are part of professional military education, such as the Naval War College (NWC).

Department of Defense and Navy Educational Policy

This section reviews past and present Department of Defense (DoD) and Navy policies for funded graduate education. In general, current policies take a broader view of educational requirements for officers.

DoD Policy

DoD Instruction (DoDI) 1322.10, revised in April 2008, requires that graduate education be established to accomplish the following goals:

- Raise professional and technical competency and develop future capabilities.
- Provide developmental incentives for military officers with the ability, dedication, and capacity for professional growth.
- Fulfill a present need, anticipated requirement, or future capability.

The previous version of DoDI 1322.10 took a narrower view, specifying that the purpose of funding graduate education was to fill billets that required that education. The new instruction represents a philosophical break from the previous directive, in that its view of the value of graduate education is much more expansive (see Table 1.1). In the words of a DoD official responsible for the policy, "knowledge is good, and more of it is preferable."[1] This change in philosophy resulted from the experiences of the military after September 11, 2001, when it encountered difficulty in finding officers having the broad range of backgrounds and academic disciplines needed for transformation, and for stability, transition, and reconstruction operations. Recent testimony from many individuals before Congress continues to call for a more-qualified and broadly educated officer corps.[2]

Table 1.1
Changes to DoD Policy

Old DoDI 1322.10 Aug 26, 2004	New DoDI 1322.10 April 29, 2008
4.1 It is DoD policy to fund graduate education fully and partially for active duty military officers required to fill Military Service requirements for validated positions.	4.1 The intent of the Department's graduate education programs are to provide fully or partially-funded educational opportunities in disciplines that fulfill a present need, anticipated requirement, or future capability and that contribute to the effectiveness of the Military Departments and the Department of Defense.

The new DoD instruction did not remove the requirement to use officers who had attended graduate school at government expense in positions having specific educational requirements. However, the instruction does require the services to provide biennial reports to DoD that include three elements. The first assesses utilization and outcomes. This includes a review of validated billets, the number of officers who have obtained funded graduate education, an evaluation of their utilization rate in validated billets, and the number of utilization tours served. While the first element focuses on utilization in validated billets, the second and third elements are broader assessments of graduate education management. The second discusses management of officers who have had a graduate education. Beyond the utilization figures, how is the service managing (e.g., assigning, retaining, promoting) this pool of developed human capi-

[1] RAND researcher interview with DoD official in July 2009. He did not say that he wished to be anonymous, but we typically start interviews by saying that comments will not be attributed.

[2] See, for example, Lt. Gen. (ret.) David W. Barno and Professor Williamson Murray, testimony to the House Armed Services Subcommittee on Investigation and Oversight, September 10, 2009.

tal? The third assesses the service posture with respect to disciplines that fulfill present needs, anticipated requirements, or future capabilities.

Navy Policy

The Navy also has a new instruction specifically pertaining to graduate education governance, which was issued after the new DoD instruction. The older instruction, Office of the Chief of Naval Operations (OPNAV) Instruction (OPNAVINST) 1520.23B (1991), provides general guidance on graduate education programs and states that the Navy offers graduate education to

- Support requirements for officers with specific subspecialty skills;[3]
- Encourage professional knowledge and technical competence;
- Provide recruitment and retention incentives;
- Recognize aspirations of individuals.

The more-recent instruction, OPNAVINST 1520.42 (2009), which provides guidance for the integrated governance of graduate education programs, states that education is a strategic investment in the future capabilities of the naval service and that education policies should develop a portfolio of skills and competencies necessary to execute Chief of Naval Operations guidance and maritime strategy.[4]

Research Approach

Our approach to the research consisted of four tasks. The first was to review the civilian and military literature concerning graduate education and its returns. The second was to compare the funded graduate education programs across the services to identify additional metrics used to measure ROI. The third was to analyze data to understand demand (billets) and supply (educated officers) and how they matched, then to use these data as a basis for a model that allowed community-level assessments of utilization. The fourth was to posit and assess measures of ROI. The central question we are addressing is, "Is there value to the Navy in providing funded graduate education?" The use of the language of return of investment is meant to imply use of an ROI framework but not a complete ROI assessment.

Limitations

As stated earlier, we did not assess all graduate education programs in the Navy but only those funded for NPS, AFIT, and civilian institutions for unrestricted line (URL) and restricted line (RL) officers. Moreover, we did not attempt to ascertain which institutions should provide the education or the costs and benefits associated with using particular institutions or relying on their curricula to provide education. We did not provide a complete assessment of ROI at the program budget level but instead offer a rough order-of-magnitude assessment for the sponsor or those responsible for education to use as a framework.

Organization of This Monograph

The monograph has six chapters. Following this introduction is a detailed review of the civilian and military literature. Chapter Three discusses the specifics of the Navy program and compares it with other military services. Chapter Four presents community-level data and our observations from running a utilization model. Chapter Five is our assessment of qualitative and quantitative benefits and costs in an ROI framework. Chapter Six contains our conclusions and policy recommendations. Additional material that may be of interest to some readers is in the appendixes.

CHAPTER TWO
LITERATURE REVIEW

This chapter discusses civilian and military literature on the theories and empirical evidence linking graduate education to organizational benefits. Figure 2.1 shows the possible benefits of graduate education by categories. The first section of this chapter discusses human and social capital development theory in relation to organizational returns. The second section takes a closer look at the contributions cited in civilian and military literature on quantifiable organizational returns. Finally, the chapter discusses various approaches for evaluating ROI and develops a hierarchal framework for measuring benefits from graduate education in the Navy.

Theories Linking Graduate Education to Human and Social Capital

This section reviews the theoretical literature on human and social capital and how they can benefit organizations.

Human Capital Theory

To discuss ROIs with respect to education, researchers often start with education's effect on the development of human capital. Increases in human capital, in turn, may generate both pecuniary and nonpe-

[3] Subspecialties will be discussed later in more detail. Beyond the staff corps, Navy communities have approximately 100 subspecialties falling into six broad areas. The subspecialties themselves resemble academic disciplines.

[4] The extent to which the Navy has institutionalized this more-liberal policy is unclear.

cuniary returns for an organization. *Human capital* is often defined as the set of acquired knowledge, skills, and capabilities that enable individuals to act in new ways (Coleman, 1998).

The skills gained from education can generally be divided into two types: hard skills and soft skills. *Hard skills* include technical capabilities that are directly applicable to specific tasks, for instance, data analysis, financial accounting, electrical engineering, or undersea warfare. John McPeck (1994) describes hard skills as being "knowledge based" because their "general range of applicability is limited by the form of thought being called upon" (McPeck, 1994). Studies have found that these of types of vocational skills tend to degrade over time without frequent use or the additional education needed, in part, because of exogenous technological changes.

Soft skills, on the other hand, are not explicitly taught during graduate education but instead are competencies gained through the process of being educated, sometimes called "learning to learn." These types of skills include critical thinking, communication, and leadership. While soft skills are less tangible, they help individuals "select pertinent information for the solution of a problem [and] formulate relevant and promising hypotheses" (McPeck, 1994). Table 2.1 compares hard and soft skills.

The civilian literature is unclear on how education develops soft skills, but these skills are strongly and positively correlated with schooling (see, for example, Oreopoulos and Salvanes, 2009; Boyatzis, Stubbs, and Taylor, 2002; and Hardison and Vilamovska, 2009). Some evidence also specifically suggests that graduate education increases soft skills that are valuable to the Navy. The services have used competency models to define characteristics of high-performing officers. One example is the Navy Leadership Competency Model, which defines five core competencies: accomplishing the mission, leading people, leading change, working with people, and resource stewardship.[1] Additionally, competencies that are deemed critical for Navy flag officer billets are closely related to some of the skills developed through graduate education (see Table 2.2). A study of naval officers who had completed a graduate degree at NPS found significant increases in the officers' own assessments of gains in seven out of ten skill areas that are closely tied to competencies desirable for chief executive officers (Filizetti, 2003).

The evidence also indicates that skill gains from graduate education have benefits beyond utilization in subspecialty billets. Opinion surveys of naval officers having a graduate degree found that over 90 percent of the individuals who had served in billets requiring graduate degrees reported that the skills gained in their education were necessary or desirable for performing their duties, while over 80 percent said that they used their education in billets other than the designated ones (Cashman, 1994).

Competencies gained through education, regardless of curriculum, may also help to compensate for lack of domain knowledge in certain billets. In a study of senior Air Force officers and civilians, Scott et al. (2007) found that leaders use such competencies as people skills, problem-solving, integration skills, and enterprise knowledge in billets for which they lacked a technical background or functional expertise.

FIGURE 2.1
POSSIBLE BENEFITS OF GRADUATE EDUCATION TO THE NAVY

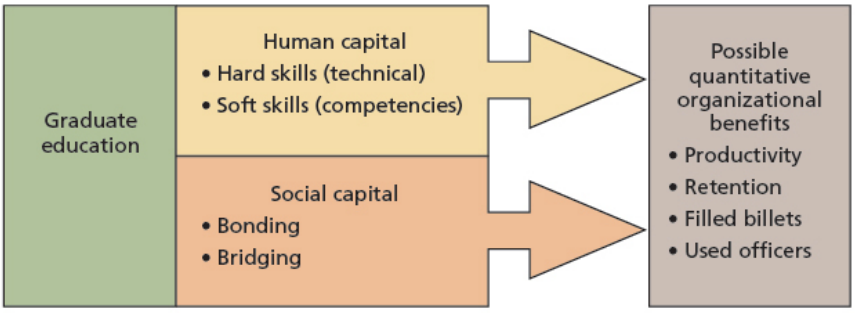

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Table 2.1
Comparison of Soft Skills and Hard Skills

Human Capital: Hard Skills	Human Capital: Soft Skills
Skills	
Data analysis	Communication
Drafting	Critical thinking
Modeling	Team-building
System analysis	Creativity
Design	Decisionmaking
Financial accounting	
Skill attributes	
Knowledge based	Process based
Degrade over time without use	Increase with experience
Easier to define, measure, and test	Difficult to define, measure, and test
Technical degrees offer specific gains	All degree curricula offer gains

Social Capital Theory

Social capital development is closely tied to human

[1] The Navy Leadership Competency Model is available on the Air Force Air University's Strategic Leadership Studies website.

Table 2.2
Competencies Are Critical in Navy Billets

Critical Flag Officer Billet Requirements[a]	Competencies Gained at NPS[b]	Competencies Gained in MBA[c]
Influencing and negotiating with people at all levels	Communications	Persuasiveness, Negotiating, Networking, Oral communication
Preparing and delivering quality oral presentations and written communication	Communications, Computer and information Technology use	Oral communication, Written communication
Exercising good judgment, perception, adaptability, and common sense to integrate priorities and eliminate irrelevant information	Ability to define and solve problems, Analytical reasoning, Technical adaptability, Research and continuous learning	Flexibility, Self-control, Attention to detail, Use of concepts, Efficiency orientation
Motivating, inspiring, and mentoring military personnel	No significant gain in collaboration and teamwork	Group management, Developing others' empathy
Guiding expectations, managing risk, and achieving results	Systems thinking and analysis, Innovation and creativity	Planning, Efficiency orientation, Systems thinking

[a] *Hanser et al., 2008.*
[b] *Filizetti, 2003.*
[c] *Boyatzis, Stubbs, and Taylor, 2002.*

capital and is widely assumed to be a by-product of education. Social capital is most commonly defined as the "networks, norms and trust—that enable participants to act together more effectively to pursue shared objectives" (Putnam, 1995, p. 665). Social capital comprises both the individual's network and the assets that may be mobilized through that network (see, for example, Nahapiet and Ghoshal, 1998). Putnam (1995, p. 667) found that education is one of the biggest contributors to the development of social capital:

> Highly educated people are much more likely to be joiners and trusters, partly because they are better off economically, but mostly because of the skills, resources, and inclinations that were imparted on them at home and in school.
>
> There is no consensus on how to measure social capital, but it is believed to help improve productive and allocative efficiency by increasing information-sharing, promoting cooperative behavior, and reducing monitoring costs by increasing trust.

Social capital can be broken down further into "bonding" social capital and "bridging" social capital. *Bonding social capital* refers to networks that form inside an organization; *bridging social capital* refers to connections among heterogeneous groups (Schuller, Baron, and Field, 2000). Bonding social capital might have negative effects if it builds "in-group" solidarity at the expense of outsiders (Fukuyama, 2002). Additionally, tightly bound groups may cut themselves off from information, innovation, or ideas with negative consequences for the organization. Bridging social capital, on the other hand, tends to increase social inclusion and encourage connections and cooperation between people from different walks of life. These ties tend to be more fragile because they require active reinforcement to maintain, but some consider them to be more valuable than homogeneous bonds (Schuller, Baron, and Field, 2000).

In the Navy context, graduate education can affect both bonding and bridging social capital. For example, while obtaining a graduate degree at NPS, an officer is sacrificing time he or she could be spending in an operational billet in his or her community, which may reduce "in-group" bonding capital. However, the officer will likely develop ties to officers in other Navy communities, other branches of the U.S. military, even with officers in foreign militaries. These bridging connections may be more useful in future joint assignments or in combined coalition operations. Officers who obtain a degree at a civilian institution may be exposed to an even broader set of viewpoints and may develop connections with future civilian policymakers.

Organizational Benefits of Graduate Education

Economists use two general models to describe how increases in human and social capital generate organizational returns. First, the productive efficiency model suggests that, as skills increase, individuals are able to get more done in the same amount of time for the same amount of money. This result might be tied to improved multitasking or to time management skills. Second, the allocative efficiency model suggests that more-skilled individuals make better decisions than do less skilled people facing similar circumstances.

While human and social capital are not directly measurable, they do lead to quantifiable benefits for an organization. The civilian literature on organizational returns to graduate education quantifies human and social capital gains through changes in productivity. Increasing employee productivity in the private sector leads to increases in profitability for a firm. In the military, increasing individual or unit productivity can likewise lead to pecuniary benefits by reducing manpower requirements and improving readiness (Mehay and Bowman, 2007). Therefore, the military literature on returns from graduate education focuses on education's effect on

officer performance, promotion, and retention.

The civilian literature crosses a broad range of sectors and degree types, although the bulk of the literature focuses on primary and secondary education. A large portion of the literature on ROI from graduate education in the military comes from research surveys and empirical studies that students and faculty at NPS, AFIT, and other service colleges have produced.

Civilian Literature

It is difficult to quantify individual productivity gains from education. Brown (2001, p. 1) states that

> One of the problems with measuring training's influence on worker productivity is that there are many areas of productivity that are intangible and difficult to quantify, such as ideas, abilities, experience, insight, motivation and so forth.

Another problem with measuring productivity gains has to do with selection bias. Individuals who attend and complete graduate education may have innate abilities that would make them more-productive workers even in absence of a graduate degree. This means that simply comparing individuals having graduate educations with those who do not without controlling for innate ability would overstate the benefits of that education. However, researchers have found that the positive effects of graduate education exist apart from selection effects.

Generally, the civilian literature quantifies individual productivity increases through salary differentials between graduate-degreed employees and comparable employees without graduate degrees. These salary differentials are a proxy for expected worker productivity gains and vary by the type of degree obtained and the sector of employment. Typically, the "funder" reaps the reward; in the private sector, the employee typically has made the initial investment for graduate education, and the ROI accrues to the individual through increased earning potential. The employer in turn pays a premium for the expected productivity gains from the education the individual has funded.

Various studies on earnings data have found individual rates of return between 7 and 46 percent, with returns generally higher for individuals who have earned a master of business administration (MBA) or technical master's degree. A 2008 study on ROI to an MBA for information technology professionals found that these individuals earned 46 percent more than those with only bachelor's degrees and 37 percent more than those with sector-specific master's degrees (Mithas and Krishnan, 2008). If the individual does a full-time MBA degree, forgoing two years of work experience, the ROIs are 36 percent relative to a bachelor's degree and 27 percent relative to a technical master's degree (Mithas and Krishnan, 2008).

Firms in the private sector also measure productivity by increases in profitability. Black and Lynch (1996) found that the average educational level of a firm's employees has a positive and significant effect on productivity in both the manufacturing and nonmanufacturing sectors and that this positive influence was higher in the nonmanufacturing firms (Black and Lynch, 1996).

Hunton, Stone, and Wier (2005) conducted one of the largest empirical studies of the effects of graduate education on professional success and tacit knowledge learning. The researchers combined standardized job performance evaluation data for approximately 6,000 accountants with survey data from around 3,000 members of the sample to compare the performance, problem-solving ability, and managerial knowledge of those with and without an MBA or master of accounting (MAcc) degree. Those with MBAs and MAcc degrees demonstrated significantly higher knowledge gains and performance evaluations than the employees who lacked advanced degrees. The authors also found that the MAcc degree is more beneficial for early and midcareer, and the MBA is more beneficial later in a career.[2]

Military Literature

The military's human resource structure is characterized by an internal labor market, a vertical hierarchy, and a closed personnel system (Asch and Warner, 1994). Military officer pay is determined by rank and time in service, regardless of the officer's educational qualifications; officers with graduate degrees do not earn more. Therefore, quantifying productivity increases in the military is more difficult than it is in the private sector. Various studies have used performance ratings as a proxy for individual productivity. Although performance ratings are thought to be highly inflated, researchers have identified useful performance metrics. In a Navy study on the effects of college quality on performance, Bowman and Mehay (2002) used the "recommendation for accelerated promotion" indicator on the officer's fitness report to identify highly productive performers. The authors

[2] Although Hunton, Stone, and Wier focused on the private sector, generalizing their results to the military might suggest that focusing on technical degrees may be more useful for officers early in their careers (O-4 to O-5), while degrees with a broader focus, such as the MBA, might benefit officers in grades O-6 and above.

found that the quality of the educational institution does not have a significant effect on performance ratings for staff officers. However, line officers with graduate degrees from either public or private top-tier colleges had significantly higher performance ratings in their early careers than their peers from less-selective institutions.

Increased promotion potential is typically considered an individual, rather than organizational, benefit. However, military studies have also used years to promotion and probability of promotion as proxies for increased productivity, which would benefit the organization. Faster promotion or higher promotion rates are assumed to equate to increased individual productivity. Branigan (2001) found that naval officers who have had funded graduate degrees have shorter times to promotion than have officers lacking graduate degrees. Bowman and Mehay (1999) found that officers with graduate degrees are more likely to be selected for promotion at the O-4 promotion boards than their counterparts without graduate degrees. However, a large portion of the relationship between graduate education attainment and promotion is due to unobserved attributes that may lead more-promotable officers to attend or be selected for graduate school (Bowman and Mehay, 1999).

For the organization, increasing retention provides quantifiable benefits: reducing recruitment and training costs and supervisory time (Fitz-Enz, 2000). Private corporations that pay for all or part of their employees to attend graduate school often stipulate a minimum contract term following graduation, which directly increases short term retention rates. As with productivity, a selection bias might also affect the retention results, although it is not clear whether the net effect would be to overestimate or underestimate retention figures. An employee who accepts education funding might be predisposed to staying with the organization and may be "signaling" these intentions by entering a graduate program. This effect may be greater in the military, which imposes an additional service obligation on graduate students; thus, "a positive preference for graduate school should be positively correlated with retention" (Bowman and Mehay, 2002). Alternatively, individuals who are predisposed to leaving an organization may pursue graduate education to increase their marketability to external employers (Jordan, 1991).

Military studies generally show a positive retention effect from funded graduate education. Opinion surveys of naval officers having less than eight years of service (YOS) who had received funded graduate education indicate that 80 percent planned to stay in the Navy for 20 years or longer (Cashman, 1994). Jordan (1991) estimated that URL officers having a graduate degree were less likely to leave the military before their O-4 promotion boards than their counterparts lacking a graduate degree and that this retention effect was more pronounced for officers having NPS degrees than for officers having degrees from other sources. Milner (2003) found that United States Naval Academy (USNA) officers who received master's degrees through the Voluntary Graduate Education Program (VGEP) were more likely to remain in the service at the end of their initial commitments than were USNA officers lacking a master's degree. In a similar study, Mehay and Bowman (2007) found that officers who had benefitted from immediate graduate education (IGE) had retention rates 25 percent higher than those of their counterparts lacking education out to seven YOS and 10 percent higher out to ten.

Approaches to Evaluating Graduate Education Benefits

The theory and empirical evidence outlined in the previous sections demonstrate the positive organizational benefits to be gained from graduate education. Employers who sponsor education and training are, however, particularly interested in ways to quantify these benefits to make efficient programming decisions. The literature on the best way to determine the ROIs for education and training has been growing.

Understanding the concept of ROI analysis begins with understanding the evaluation methodologies behind it. One of the most common models was adapted from an existing model for evaluating training and development efforts. This adapted model includes five progressively complex levels of evaluation (U.S. Government Accountability Office, 2003):

1. Reactions—focused on opinions of an education program; participant's response to the program
2. Learning—focused on amount of knowledge gained from the program
3. Application—focused on link between learning and changes in on-the-job behavior
4. Impact—focused on the effect of the education program on the organization's performance
5. ROI—compares the benefits (as quantified in dollars) to the costs of the education program.

Table 2.3 suggests a hierarchy of measures for the Navy, including recommended data collection tools and assessment frequency.[3] Although the higher assessment levels may allow more-precise calculation of net benefits, they also require more complex analysis, such as longitudinal studies, and thus may be more costly to conduct. Therefore, we recommend conducting these assessments only every three to five

years. Moreover, many of these assessments could be accomplished as student theses. At the lower levels of assessment, it may be cost-effective to track performance continuously, and net positive feedback at these levels of assessment would imply that the education program is providing value to the organization.

Jack Phillips has suggested four steps that organizations should take when moving along this hierarchy of assessment measures toward an ROI calculation (Phillips, Stone, and Phillips, 2001). The first step is to collect data to prepare for the evaluation through surveys, observations, or other methods. Appendix B includes a further discussion of recommended practices for data collection and analysis. The Navy already collects personnel data and can both improve and expand the educational variables that it tracks.

The second step is to isolate educational effects. This step can be achieved through subjective assessments by managers and former students on how education might change measurable outcomes. The literature suggests a number of methods for testing competency gains through both self-assessments and external assessments. The examples listed below are from Boyatzis, Stubbs, and Taylor, 2002, and Hardison and Vilamovska, 2009:

Self-Assessments

- Learning Skills Profile—individuals rate 72 skill statements on levels from 1 (no skill) to 7 (leader and creator)
- Self-Assessment Questionnaire—72 questions assessing 21 competencies

External Assessments

- External Assessment Questionnaire—given to boss, colleagues, peers, etc., to assess competencies
- Critical Incident Review—an observed interview evaluating 16 different competencies
- Group Discussion Exercise—an observed simulation; participants are given a set of 3 problems and must talk through their recommendations to their chief executive officer (16 competencies evaluated)
- Presentation Exercise—an observed presentation with a question-and-answer session
- Critical Learning Assessment—rated tasks requiring students to apply several aspects of critical thinking, including problem solving, analytic reasoning, and written communication skills.

The third step is to monetize the data on education effects by assigning values to the education outcomes predicted in step two and calculating an annual program value. The direct educational costs and the opportunity costs should also be monetized in this step. Finally, ROI is calculated by dividing the estimated value of the education by its cost.

Table 2.3
Hierarchy of Suggested Measures

Levels of Assessment[a]	Data Collection Tools	After Degree	1st Tour After Degree	After Utilization Tour	Biennial Report	3–5 years
Reaction						
1. Satisfaction with program	a. Opinion surveys (Did you like the program?)	X	X	X		
Learning						
2. Knowledge or skills gain	a. Pre- and post-tests	X				
	b. Opinion surveys (Did you gain knowledge/skills from the program?)	X	X	X		
Application						
3. Effective utilization	a. Number of subspecialty billets filled				X	
	b. Number of funded officers in subspecialty billets				X	
	c. Billets vs. inventory				X	
	d. Billet fit (exact vs. matrix match)				X	

Table 2.3—Continued

Levels of Assessment[a]	Data Collection Tools	After Degree	1st Tour After Degree	After Utilization Tour	Biennial Report	3–5 years
Impact: organization						
5. Retention	a. YOS beyond degree award					X
	b. YOS beyond ADSO					X
	c. YOS career (active and reserve)					X
6. Performance in billet	a. Supervisor surveys			X		
	b. Fitness reports (graduate education vs. non–graduate education)					X
7. Contribution to strategy and policy	a. Thesis topic				X	
	b. Thesis quality				X	

Table 2.3—Continued

Levels of Assessment[a]	Data Collection Tools	After Degree	1st Tour After Degree	After Utilization Tour	Biennial Report	3–5 years
12. Education program cost	a. Number of funded quotas x cost of funded quota				X	
13. Economic return	a. Community review using utilization data				X	

[a] Our levels of assessment are adapted from a four-level model for evaluating training programs and the Government Accountability Office's five-level model (2003). We sought measures that met the criteria of being complete and usable and of conveying understanding.

In the next two chapters, we take a closer look at the Navy program parameters and data, and in Chapter Five, we use existing community-level data to build an ROI framework for the Navy's education program.

CHAPTER THREE
NAVY PROGRAM AND SERVICE COMPARISONS

Graduate education for naval officers dates back to the 1800s, when USNA engineers were sent abroad

[3] Appendix B includes more specific recommendations for data tracking and analysis.

to earn graduate degrees. In the early 1900s, when the Navy tried to set up additional service schools for its officers, it faced the trade-off between meeting its short-term operational needs and the long-term benefits of a better-educated officer corps (Powell, 2004). A similar issue remains today: The Navy must determine the optimal level of officer graduate education to meet required capabilities given finite resources in terms of officer endstrength and graduate education funding.

The Navy's primary goal in offering funded graduate education to its officer corps is to "support requirements for officers with specific subspecialty skills" (OPNAVINST 1520.23B, 1991). Thus, the Navy manages its education programs through an integrated manpower and personnel classification system that uses subspecialty codes to identify officer requirements for advanced education, functional training, and significant experience in various fields and positions. The subspecialty code identifies billets requiring specific qualifications and also identifies officers who possess specific qualifications. The code itself has five characters. The first four characters are numbers that identify disciplines (e.g., functional areas and concentrations and educational specialization) needed for a particular billet, while the fifth character is a letter that indicates the level of training, education, or experience needed.

For the purposes, of this study we focused on P- and Q-coded subspecialty designators. Officers having a funded master's degree and billets that require a master's degree carry P-coded designators.[1] Officers who have served in a P-coded billet may receive a Q-code designator, which indicates a "proven subspecialist," meaning that the officer has both a master's degree and experience in his or her subspecialty. A Q-code qualifies the officer to serve in a Q-coded billet. The formal definitions for P and Q codes are as follows (U.S. Navy, 2010, pp. B-11, B-12):

- **P code:** Requires extensive knowledge of theories, principles, processes, and/or techniques certified through the acquisition of the master's degree for optimum performance of duty; also requires the conception, implementation, appraisal, or management of complex Navy and/or DoD programs.
- **Q code**: All P-coded criteria are applicable; additionally the billet requires the combination of both professional experience and proven subspecialist at the master's degree level.

Officers are considered *funded* if they attend graduate school full time for 26 weeks or more, regardless of whether the degree program is partially or fully-funded. For a *fully-funded program*, the Navy provides full pay and benefits for the duration of the course of study plus all tuition costs. For a *partially-funded program*, the Navy supplies only pay and benefits, and the individual or an organization other than the Navy pays the tuition. An officer will typically only receive one funded graduate school opportunity in his or her career but may acquire additional unfunded degrees. Voluntary graduate school programs, such as tuition assistance or the Montgomery G.I. Bill, are considered unfunded graduate education. Such military institutions as the NPS, AFIT, and various war colleges and civilian institutions offer funded graduate degree programs. About one-half of the full-time residential programs are undertaken at either NPS or NWC (Moskowitz et al., 2008). Each fiscal year, the Navy has about 390 funded master's degree quotas (seats) at NPS, 25 at AFIT or other military institutions, and 200 at various civilian institutions.2 About 550 of these are fully-funded, and the rest are for such other programs as partially-funded scholarships. Appendix A discusses some of the programs through which naval officers can receive a master's degree in more detail.

By DoD policy, officers who receive funded graduate education incur an active-duty service obligation (ADSO) of three months for every one month of schooling for the first year of schooling. The average graduate degree program lasts approximately 18 months. Navy policy requires a minimum three-year ADSO for a funded master's degree and a maximum five-year obligation for a funded doctorate. This ADSO may be served concurrently with any other obligation.[3]

P- and Q-coded billet requirements establish the de-

[1] Officers who complete an unfunded master's degree may submit paperwork to the Bureau of Naval Personnel to add a P-code designator to their personnel file. These officers are available for assignment to P-coded positions but have no utilization requirement. According to interviewees, there may actually be disincentives to reporting unfunded graduate education to the bureau.

[2] In Navy terminology, quota refers to an individual billet for a training or education course. Navy program managers control a discrete number of quotas for each program, which they can allocate to individuals. Typically, the individual's command will request a quota for a specific program, and the program manager will either approve or disapprove the request.

[3] If the Navy funds an officer for a master's degree through IGE, the officer's ADSO is five years served concurrently with any other service obligations.

mand for naval officers with graduate degrees (Table 3.1). In 2008, approximately 5,960 total P-coded billets and approximately 760 Q-coded billets were available for those in grades O-3 through O-6 (captain). For the purposes of this study, we removed the medical, dental, law, and chaplain billets from the total validated billets, resulting in 4,397 P-coded and 481 Q-coded billets.

Table 3.1
Distribution of Billets Requiring Master's Education, by Grade

Grade	O-3	O-4	O-5	O-6	Total
Total authorizations (P and Q codes)	1,720	2,129	1,957	915	6,721
Authorizations without medical, dental, chaplain, and law	1,127	1,529	1,513	709	4,878

SOURCE: Data from Defense Manpower Data Center, 2008.

We used the number of funded school quotas to determine the supply of officers having graduate degrees. Every year the Navy sends approximately 550 to 600 officers to school to receive advanced degrees. Most officers complete their graduate degrees between grades O-3 (lieutenant) and O-4; historically these two grades have accounted for 70 to 80 percent of all graduate degrees attained per year (Moskowitz et al., 2008). As of 2009, approximately 12,150 naval officers in grades O-3 and O-6 had master's degrees, as designated by either a P-code (8,956) or Q-code (3,194).[4] These are the officers available for utilization in billets requiring graduate degrees. However, the number of officers who have had funded graduate education in 2009 was 6,683. Policy only requires funded officers to serve a utilization tour.

DoD utilization policy for officers who have had funded graduate education—which was modified in 2008—states that officers should be assigned to a P-coded position as soon as possible following degree completion and, ideally, immediately after. The current Navy policy (OPNAVINST 1520.23B) has not been revised since 1991 and states that

> Officers who have received funded graduate education will serve one tour in a validated subspecialty position as soon as possible but not later than the second tour following graduation.

In practice, the "second tour following graduation" has been interpreted as the second shore tour following graduation to account for operational requirements, which often preclude URL officers from immediate utilization in validated billets.

Navy education program managers currently use the one-tour officer utilization metric to evaluate and report on the effectiveness of master's degree programs. Program managers track the percentage of officers who serve in a validated billet within one shore tour after receiving their degrees and within their careers. A qualifying utilization tour typically lasts from two to three years and varies by Navy community.

Given the number of Q-coded officers in the Navy in 2009, we can assume that 26 percent of all graduate-educated officers currently in the Navy between grades O-3 and O-6 have completed at least one utilization tour. The Navy reports that 23 percent of officers complete one utilization tour within two shore tours following graduation. The estimated average career assignment rate for active-duty officers to utilization billets across the entire Navy is 53 percent, while URL and RL assignment rates are between 47 and 73 percent, respectively.[6] Rates also vary by community; for example, oceanography and civil engineering have the highest career utilization rates, while aviation and special operations have the lowest.

While approximately 86 percent of all P- or Q-coded billets that require master's degrees are filled, the officers who fill them do not necessarily have graduate degrees or degrees specific to the billet requirements (Education Coordination Council, 2010). The efficiency of the subspecialty billet program is evaluated in terms of exact fits, exact matches of billet and officer subspecialty codes, and matrix fits, close matches of billet and officer subspecialty codes.[7] The estimated average matrix fit rate for all communities is about 35 percent; the exact fit rate is lower, only about 24 percent. Again, the URL community performs poorly in matching graduate degrees to billet requirements, with 15 percent being exact fits, while 21 percent are exact fits in the RL community.[8]

[4] This includes all staff, URL, and RL officers but excludes limited-duty officers and chief warrant officers.

[5] There is no utilization requirement for unfunded education.

[6] This figure may overstate career assignment rates because the data exclude officers who have received a graduate education and have left the Navy without completing a utilization tour.

[7] In a matrix match, the first one or two numbers of the subspecialty code are the same for the billet and the officer, but the other numbers might not match. For instance, a billet designated 2000 for "National Security Studies—General" might be filled with an officer with the subspecialty 2400P for Strategic Intelligence.

SERVICE COMPARISONS

Marine Corps Graduate Education Program

The Marine Corps has two funded graduate education programs. The largest, which is fully-funded and accounts for more than one-half the service's annual quotas, is the Special Education Program (SEP) set out in Marine Corps Order (MCO) 1520.9G. Officers in the SEP program may attend NPS, AFIT, or accredited civilian universities.[9] The other program, set out in MCO 1560.19E, is the Advanced Degree Program, which is intended to augment the SEP by partially funding degrees at civilian institutions.[10] Specific quotas for various curricula at particular schools are based on requirements projected three years in advance. Officers who are accepted and enroll in a graduate education program incur an ADSO of three YOS for the first year of school and four YOS for schooling that lasts more than one calendar year. The ADSO is concurrent with any other service obligation.

With the exception of degrees awarded at staff colleges, all graduate degrees are awarded at grades O-1 (second lieutenant) through O-4 (major). Although this rank limitation exists, there are no time-in-service limitations for graduate education. Officers must apply to a graduate education selection board, and the annual admission process is competitive. The board evaluates and selects officers based on "career potential, past performance of duty, previous academic record, and availability for assignment" (MCO 1520.9G, 2003). Officers are asked to list their top five degree curricula and are paired with degree programs based on program availability, aptitude, and military occupational specialty (MOS) requirements. Upon graduation, the officer is assigned an additional MOS (AMOS). Officers are encouraged to align differences would require a detailed analysis of billet coding, which was beyond the scope of this research. Navy Program and Service Comparisons 29 their degree programs with their primary MOS to stay close to their career paths during their utilization assignments.

The Marine Corps funds approximately 180 annual graduate education quotas to fill approximately 385 billets. An officer who is eight to ten months out from graduation will receive orders for a follow-on utilization tour in a validated billet. The Marine Corps SEP policy recognizes the particular challenges career-path restrictions aviators face in completing utilization tours. Because graduate education and utilization tours can take aviators out of the cockpit for up to five years (a combination of the length of the graduate course and the utilization tour), the SEP instruction requires aviators to meet their first "flight gate" before applying to SEP.[11] On completing a utilization tour, Marine Corps officers retain the AMOS and are monitored for possible subsequent assignments to utilization tours; however, subsequent tours are rare (Blair, 2009).

The Marine Corps philosophy toward graduate education is to develop skills that fulfill immediate and specific requirements. In FY 2009, 385 Marine Corps billets required graduate educations. Officers are expected to serve a three-year utilization tour immediately after graduating. The Marine Corps defines *utilization* as work that exactly or closely matches the officer's AMOS and the billet's AMOS requirement. According to program managers, officers are assigned to billets that do not exactly or closely match their AMOSs less than 1 percent of the time. In 2009, the Marine Corps reported a 96-percent utilization rate for officers in their first tours following graduate education, the highest utilization rate for any of the services for which researchers had accurate figures (Blair, 2009).

Air Force Graduate Education Program

The Air Force view of graduate education is more consistent with the new DoD instruction than that of the Marine Corps. The general philosophy is that graduate education gives officers critical thinking skills 30 Evaluating Navy's Funded Graduate Education Program that are used every day in an officer's job, regardless of billet requirements. The Air Force describes graduate education programs as helping to manage resources and support objectives in "an increasingly complex international environment with rapidly changing science and technology" (Air Force Instruction 36-2302, 2001). The Air Force provides advanced academic degree (AAD) funding

[8] The relative efficiency of the URL communities in exact fits to billets may be due to differences in billet coding practices between the URL and RL communities; evaluating thes edifferences would require a detailed analysis of billet coding, which was beyond the scope of this research.

[9] Officers must be accepted by the civilian institution, and the curriculum should be one that is not readily available at either NPS or AFIT.

[10] Officers are responsible for their own tuition, books, and fees but receive all their regular pay and benefits while at school.

[11] The first flight gate is defined as six years of operational flying in the first ten years of service. Provided the first flight gate is met, aviation incentive pay will continue through graduate school and in the follow-on utilization billet.

to "prepare officers to perform the duties of a specifically designated position (or to meet the needs of a particular career field)" (Air Force Policy Directive 36-23, 1993).

The annual graduate school quota is about 460 per year, given funding availability and student man-year (end-strength) limitations. Funded graduate opportunities are available at AFIT, intermediate service colleges, war colleges, and a variety of civilian institutions.[12] Officers typically attend graduate school at the O-3 and O-4 levels but may have up to three or four funded degrees throughout their careers.[13] Graduate education is a factor in promotion boards, and 98 percent of officers selected for promotion at their O-5 (lieutenant colonel) boards have graduate degrees. Officers may also have more than one funded degree in their career paths, including a doctorate or programs at war colleges and intermediate service colleges.

Officer selection is based on the "best available" officer, that is, the officer with the right background and aptitude who is at the right point in his or her career track. Typically, the officer's senior rater nominates the service member, then the development team for the career field evaluates and steers him or her into an available program following "best fit" criteria. Funded master's programs typically last two years, while doctoral programs typically take five years. The ADSO for an officer receiving funded education is three years for a master's degree and five years for a doctorate.

After graduation, the officer is assigned a P code for a master's degree or an R code for a doctorate.[14] Career-field managers validate billets that require graduate education every year, and the subspecialty areas depend on the current priorities of the Air Force. Air Force officers who have had funded graduate education are required to serve in a validated billet within two assignments following graduation. By directive, the Air Force uses two metrics to evaluate compliance with graduate education policy annually:

1. The percentage of AFIT-produced degrees (master's and doctorate) as a fraction of the number of AAD billet requirements.
2. The percentage of AFIT graduates assigned to AAD billets within two assignments following graduation.

In its 2008 biennial review of graduate programs, the Air Force reported that 59 percent of officers who had received a funded graduate degree between FY 2006 and FY 2008 had been assigned to an AAD billet within their first two assignments following graduation. The remaining 41 percent, who had not been assigned to an AAD position, were still in their first assignments following graduation and were expected to fill AAD positions in their next assignments. The Air Force also reported an additional metric in this review, an evaluation of whether the individuals who were not assigned to an AAD billet in their first assignments used their graduate educations in the non-AAD billets. This analysis was subjective and based on a comparison of the observed billet requirements with the degree curricula. The Air Force reported that 31 percent of officers in non-AAD assignments immediately following graduation were in positions that utilized their AAD skills.

Army Graduate Education Programs

The Army considers higher education to be both something of a sabbatical from operational responsibilities and a broadening experience. GEN David Petraeus elaborated six reasons that he believed graduate education (at civilian universities in particular) was important to the Army (Petraeus, 2007):

- It took military officers out of their intellectual comfort zones, which is critical in developing adaptable and creative leaders.
- It exposed them to different viewpoints and cultures.
- It provided general intellectual capital.
- It helped officers develop and refine communication skills.
- It helped officers improve critical-thinking skills.
- It imparted intellectual humility and helps raise individual standards of excellence.

The Army currently runs two separate graduate education programs. The first, the Advanced Civil Schooling program, focuses on meeting validated billet requirements. The program funds approximately 412 graduate education quotas annually to

[12] Graduate degrees at civilian institutions are sponsored by AFIT and are generally approved only if there is no comparable curriculum at AFIT.

[13] Pilots tend to have different career timing and graduate school opportunities because of the pressures to keep them in the cockpit and to get an ROI for their pilot training.

[14] Professional degrees, such as legal or medical doctorates, receive an "S" code. A list of data codes can be found in Air Force Instruction 36-2305.

Table 3.2
Cross-Service Comparisons

	Navy	Air Force	Army	Marine Corps
Active-duty service obligation	Master's, 3 years PhD, 5 years	Master's, 3 years; PhD, 5 years	3 years for each year of study[a]	3 years for 1 year of study; 4 years for >1 year
Size of officer corps, O-3 to O-5[b]	25,609	37,900	36,600	11,620
Annual graduate education quota	~550	~460	~400[d] +200[e]	~180
Quota-to-billet requirement ratio	1:9	1:6	1:5	1:2
Billet requirements, O-3 to O-6	~5,000[c]	~2,600	~2,050	~385
Percentage of all billets	20	9	6	3
Officer utilization rates (%)	23[f]	59[g]	Data unavailable	96[g,h]
Measures of program effectiveness	Utilization in two shore tours over a career	Utilization in first or second assignment	Utilization and retention	Utilization and reutilization

[a] A two-year degree would then mean a six-year ADSO.
[b] This number excludes all officers in medical, law, and chaplain specialties.
[c] Approximate number of P's and Q's.
[d] Advanced civil schooling.
[e] Expanded Graduate School Program.
[f] In two shore tours. These data are from the Navy's Biennial Review of Graduate Education Programs dated December 10, 2008.
[g] In the first assignment.
[h] The Marine Corps reports this as an "exact fit" with degree and billet assignment.

fill about 2,000 validated billets.[15] The Army stratifies these quotas by low-, medium-, and high-cost universities and will pay up to $45,000 in total tuition for high-cost universities, such as Harvard or Stanford.[16] The Army tries to select "quality" officers for the Advanced Civil Schooling program and, in particular, tries to send high-performing, high-aptitude officers to elite universities.

The second program was started to provide retention incentives to Army officers who have seen higher operational tempos and increasing deployment-to-dwell ratios in recent years because of the conflicts in Iraq and Afghanistan. The Expanded Graduate School Program currently funds 200 to 400 quotas and is expected to have funding for as many as 600 by 2012. Graduates of this program may elect to do a degree from a broader range of curricula and institutions and are not required to complete a utilization assignment; however, they are required to complete an ADSO.

The Army has the longest ADSOs of any of the services. Officers who receive funded graduate education are required to serve three months of active-duty for every one month of education. This requirement means that the typical two-year master's degree incurs an ADSO of six years following graduation.

Like the other services, the Army also looks at utilization rates to evaluate the performance of its funded education programs.[17] Officers' records are flagged as soon as they receive a funded degree, and the assignment officer is required to check with the utilization manager for follow-on assignments before the flag can be removed from the officer's record. The metric for measuring performance in the Expanded Graduate School Program is simply retention rates.

CROSS-SERVICE PRORM PARAMETERS AND MANAGEMENT

Table 3.2 compares advanced academic programs and billet requirements across the services, showing that, proportionally, the Navy has more billets requiring officers with graduate degrees than the other services do. In fact, relative to the overall size of the officer corps, the Navy, with approximately 5,000 billets and 25,600 officers, requires about three times as many as the Army or Air Force and nearly nine times as many as the Marine Corps.[18]

Again relative to the size of its officer corps, the Navy also has more quotas for graduate education than the other services do. However, these quotas are not proportionate to the billet requirements. Every year, the Navy has one quota for about every nine validated billets. The Army has one for every five validated billets, the Air Force one for every six, and the Marine Corps one for every two. Given the potential availability of eight billets to every officer in the Navy who has a new graduate degree, officer utilization rates could be expected to be very high. However, the one-tour utilization rate in the Navy is less than 25 percent within two tours after graduation and an average of 51 percent over a career. These are the lowest rates among the services for which utilization data were available.

The cross-service comparison suggests that, while all the services educate to fill validated billets, slight variations occur in services' overall philosophy toward graduate education. In addition, there are considerable differences in program management and program parameters between the Navy's graduate education program and those of the other services.

[15] In the past, the Army has had up to 5,300 validated billets.

[16] This is in addition to the programming rate for each officer which includes full pay and benefits.

[17] The Army was not able to provide us information on utilization rates from its most recent biennial review of graduate education programs.

[18] It is unclear whether the high number of billets requiring graduate education in the Navy relative to other services is due to additional technical requirements in the Navy or whether the billet validation criteria for graduate education differ substantially between the services. This would require a detailed analysis of billet validation procedures, which was beyond the scope of this research but would be a valuable area for further research.

Chapter Four explores program parameters and utilization management within the Navy in more detail.

CHAPTER FOUR
COMMUNITY-LEVEL DATA AND UTILIZATION MODEL

Not only do the services differ from one another in how they manage their graduate education programs, but the various communities within the Navy have differences from one another. Community managers and education program managers have highlighted their philosophical differences about graduate education and the billet structure and utilization rates among the URL, RL, and staff corps communities.

URL officers in the Navy are officers who are qualified to command operational units, ships, or aviation squadrons and include surface warfare, submarine warfare, aviation, and special warfare communities. RL officers, such as information professionals, information warfare officers, and naval oceanographers, are not eligible for command at sea. Career opportunities, including educational and utilization opportunities, are thought to differ between URL and RL communities because of the extra position requirements (career wickets) necessary for operational commands in URL communities.

We explored these differences further by developing a system dynamics leader succession model to improve our understanding of how officer assignment decisions and career management affect utilization rates among various communities. This model starts with a pool of graduate-degreed officers and makes certain assumptions about how these officers progress though their careers, including promotion and retention rates up to grade O-5 (commander).[1] Although the model could be modified for any Navy community, we selected one representative community from the RL and one from the URL: the surface warfare officer (SWO) community for the URL community and the meteorology and oceanography (METOC) for the RL community.[2]

COMMUNITY DIFFERENCES

Surface Warfare Community

SWOs are required to complete four sea tours (two tours as a division officer and two as a department head) within their first 10 to 12 YOS, three of which are expected to be in mainstream afloat billets.[3] With these operational demands, individuals in the SWO community typically have one opportunity to attend graduate school in their first ten YOS, during their first shore tour at 4 to 6 YOS and grade O-3. A very small percentage of officers may complete their graduate schooling earlier through the VGEP or IGE program, and some may not complete graduate education until they attend NWC at higher grades. Approximately 90 to 100 funded graduate education quotas are available to the SWO community every year.

Subspecialty requirements in the SWO community fall into five broad categories and 29 subcategories. The subspecialty areas having the most billet requirements are listed in Table 4.1. A majority of the billet requirements in this community are for technical subspecialties that are closely related to operational roles. In URL communities, master's level and higher education requirements are not normally applied to shore duty billets for grades below O-4.[4]

Retention has been a frequent concern for the SWO community. Retention rates are typically measured at 7 to 9 YOS and have mainly fluctuated between 30 and 40 percent in the past decade (Lorio, 2006). SWOs incur an ADSO for graduate education, which is the same as for other communities. However, assignments to some graduate degree programs also require SWOs to sign up for SWO Continuation Pay, which is designed as a retention incentive and awards officers up to $50,000 to stay in the SWO community and complete two operational department-head tours with a deployable unit. Together, these two sea tours typically last five to six years, including training and the time involved in changing duty stations. Thus, an SWO who agrees to attend graduate school is actually more likely to have a minimum fiveyear commitment to active service following his or her graduation.[5]

Therefore, retention rates at the 7- to 9-year point for SWOs who have had graduate degrees may be artificially higher than those for officers without

[1] See Appendix C for more details.

[2] The METOC community is also sometimes called the OCEANO (for oceanography) community.

[3] See Moskowitz et al., 2009, for more on the operational demands SWOs face.

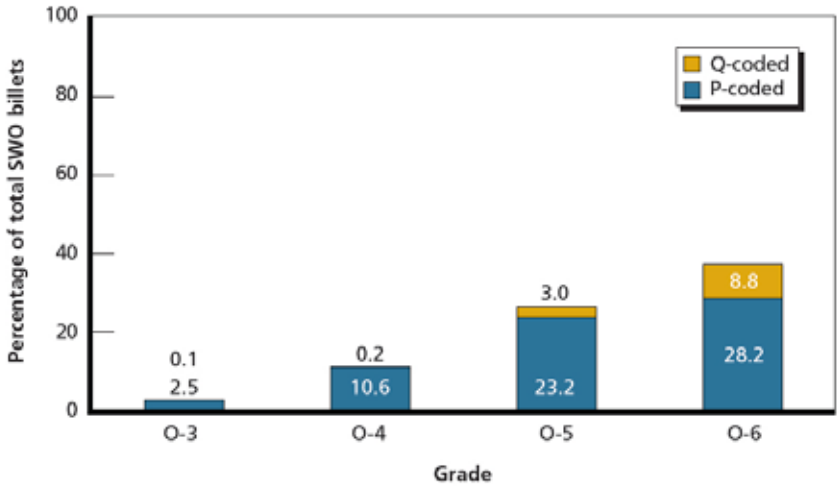
[4] See U.S. Navy, 2010. Shore-duty billets below the O-4 level might benefit from advanced degrees; however, these billets are not likely to be designated for officers with graduate educations because the timing of degree attainment in the URL communities precludes most officers from being available to fill these billets before grade O-4.

[5] In the case of the SWO community, the "unofficial" ADSO is similar to the Army's official ADSO for graduate education.

Table 4.1
Top Five Subspecialty Requirements in the SWO Community

Subspecialty Area	Code	Total P and Q Billets
Undersea warfare	6301	88
Combat systems	5700	54
Plant propulsion	5203	44
General engineering and technology	5000	43
General operations	6000	39
Total		268

Figure 4.1
Distribution of P- and Q-Coded Billets for Unrestricted Line Officers Qualified in Surface Warfare (111x)



SOURCE: Data from Defense Manpower Data Center, 2008.
RAND MG995-4.1

graduate degrees and are thus not necessarily accurate representations of the effect of graduate education on retention.

Promotion incentives in the SWO community are not currently aligned to encourage graduate degree attainment or utilization. Although the SWO community has begun to track promotion statistics for officers who have graduate degrees, master's degree attainment or utilization in a validated billet is not a required criterion for promotion at any grade. Community managers suggested that promotion is primarily based on performance in operational billets and, at most, a graduate degree on an officer's record might be a "tie-breaker" in the promotion board, given two officers with similar promotion potential in all other respects.

The SWO community in 2008 had a total of 385 P-coded billet and 49 Q-coded billets out of 4,485 total SWO billets between grades O-3 and O-6; thus, billets requiring a master's level of education accounted for fewer than 10 percent of all SWO billets.[6] As Figure 4.1 shows, the distribution of P and Q billets increases at higher grades, and these billets account for 37 percent of all billets at the O-6 level compared with only 2.5 percent of billets at the O-3 level. This distribution of billets suggests that this community has proportionally greater requirements for graduate degrees and proven subspecialists at the higher grades.

METOC Community

The METOC community has designated specialty discipline areas in three main categories—physical oceanographers, meteorologists, and generalists—which are further subdivided into 12 subdisciplines. Initially, officers are expected to choose a prime specialty area (meteorology or oceanography) and then gain strong expertise in a subdiscipline throughout their careers.

A majority of officers entering the METOC community are selected into the program before commissioning but are actually commissioned as unqualified SWOs and must first fulfill an initial SWO division officer tour. Upon qualification as an SWO, they are automatically redesignated into the METOC community. The METOC community also accepts officers who laterally transfer from other communities, and there are a limited number of officers who are directly commissioned into the METOC community. The first SWO tour is followed by an initial METOC experience tour, which helps the officer understand the METOC community and select a discipline area. At about six to nine years into their careers, METOC officers are expected to complete an education tour—a two-year course of study leading to a master's degree in physical oceanography and meteorology. Most of these degrees are completed at NPS, although a select few (typically

[6] The SWO detailer is responsible for filling a set number of discrete 1110-coded (SWO) validated billets, as well as a "fair distribution" of nondiscrete 1050- and 1000-coded (any URL) validated billets. For the purpose of this research, we calculated billet numbers for SWO-designated billets only.

one per year) complete their degrees through the Massachusetts Institute of Technology–Woods Hole Oceanographic Institute Joint Program in Oceanography. Each officer is strongly encouraged to choose a thesis topic in his or her preferred subdiscipline.

Officers receiving funded education are expected to do a payback tour in a coded billet. However, the first tour immediately following the education tour is an out-of-community operational tour, sometimes known as an "O-4 sea tour." After this initial tour, officers are encouraged to pursue their discipline track throughout the remainder of their careers, culminating in an O-5 milestone tour, which again utilizes their specialized experience.

The METOC community's philosophy is that "all career officers will attend postgraduate education and obtain a master's degree."[7] In addition, in terms of promotion potential, service in a P-coded billet is considered "necessary, but not sufficient to select to O-5."[8] The billet structure and distribution for the METOC community reflect this emphasis on graduate education. The METOC community has a total of 135 P-coded and 106 Q-coded billet requirements, accounting for 65 percent of the total billet requirements. As Figure 4.2 shows, over one-half the billets at every grade require a master's degree, and at grades O-5 and O-6, over one-half of all billets require a proven subspecialist. The high percentage of billets requiring proven subspecialists suggests a need to reuse officers in validated billets throughout their career.

UTILIZATION SCENARIOS LEAD TO DIFFERENT OUTCOMES FOR COMMUNITIES

Researchers built a system dynamics leader succession model to test different utilization scenarios in the two communities. We used figures from the Navy's model for graduate school quotas and also made various assumptions about career progression and timing of graduation and utilization tours.[9] In accordance with Navy policy, the researchers assumed that utilization tours would occur at the first opportunity following graduation. Initial model runs examined utilization possibilities given different retention rates for the SWO and METOC communities.

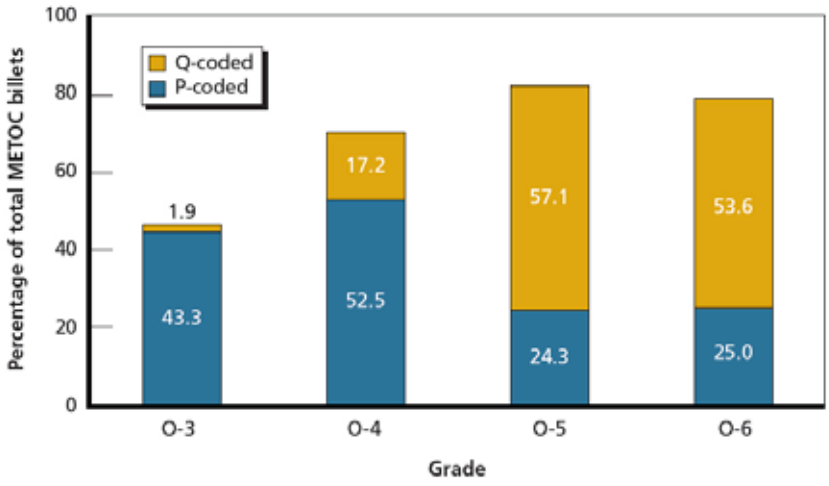
Table 4.2 shows outputs from various model runs in the SWO community. We examined retention rates at 40, 65, and 95 percent. We chose 40 percent as it was the upper bound of average retention rates for this community from the past decade and a maximum retention rate of 95 percent, which would be consistent with retention rates seen in some of the RL communities to make comparisons between communities. However, a 65-percent retention rate would be most realistic for the SWO community,

Table 4.2
Utilization Scenarios in the SWO Community (percent)

Retention at 7–10 YOS	Grade	Career Utilizations: One	Two	More than two
95	O-3	100	100	100
	O-4	100	100	100
	O-5	11	83	100[a]
	Total[b]	54	91	100
65	O-3	100	100	100
	O-4	100	100	100
	O-5	3	57	100[a]
	Total[b]	48	78	100
40	O-3	100	100	100
	O-4	94	100	100
	O-5	0	25	100[a]
	Total[b]	46	61	100

[a] Might require more than one utilization in grade.
[b] Assumes 91 SWO graduate education quotas are funded annually.

Figure 4.2
Distribution of P- and Q-Coded Billets for Restricted Line Officers Qualified in Special Duty Oceanography (180x)



SOURCE: Data from Defense Manpower Data Center, 2008.
RAND MG995-4.2

[7] Navy Personnel Command website, OCEANO detailer's pages.

[8] Navy Personnel Command website.

[9] See Appendix C for complete model assumptions and limitations.

Table 4.3
Utilization Scenarios in the METOC Community (percent)

Retention at 7–10 YOS	Grade	Career Utilizations: One	Two	One at every grade	More than two
95	O-3	100	100	100	100
	O-4	100	100	60	100
	O-5	11	83	100	100[a]
	Total[b]	54	91	79	100

[a] Might require more than one utilization in grade.

[b] Assumes 15 METOC graduate education quotas are funded annually.

in line with the literature estimations that graduate education improves retention by about 25 percentage points.

In the SWO community, one tour in a utilization billet in an officer's career was sufficient to fill all SWO-only, P-coded billets at the O-3 and O-4 level, even at retention rates lower than 50 percent at seven to ten years. However, with nearly perfect retention rates at seven to ten years and only one utilization tour per career, less than 15 percent of the O-5 P-coded billets can be filled by officers with graduate degrees. If officers complete two or more utilization tours during a career, it becomes possible to fill all the O-5 P-coded billets, given the quotas and billets. Therefore, for the SWO community, the available quotas for graduate education and the billet structure are currently such that at least some officers must complete more than one utilization tour within a career for all the P-coded billets to be filled by officers having master's degrees. Because most officers receive funded education at grade O-3, utilization possibilities at the O-5 level (which has the highest proportion of billets) are sensitive to retention rates. However, as Table 4.2 shows, the effects of improved retention on the SWO community's ability to fill billets are small compared to those of reutilization. For example, increasing retention from 40 to 95 percent at seven to ten years increases the percentage of billets filled by only 6 percent (46 to 54 percent); a second utilization tour increases fill possibilities by 30 to 70 percent depending on the retention rates used.

Model runs for the METOC community paint a somewhat different picture than those for the SWO community. The METOC community does not have the same retention issues as the SWO community, so we assumed a 95 percent retention rate. A single utilization tour in a METOC officer's career leaves barely enough school quotas to fill the O-3 billet requirements (even with high retention). Given the model parameters, it was not possible to fill all the requirements in this community without utilizing officers in subspecialty-coded billets at least once in every grade. The percentages in Table 4.3 also do not reflect the Q-coded billet requirements, which are substantial in grades O-5 and O-6. If we added Q-coded billets into the model, it is likely that officers who have had graduate degrees would have to complete more than one utilization tour *at every grade* to fill all the requirements.

The results from this utilization model highlight the importance of career management for officers who have graduate degrees and of reutilization of officers with subspecialties. If officers who have graduate degrees are expected to complete only one utilization tour in a career, the SWO community would need more than double its current school quota to 190 slots to fill all the P-coded requirements in grades O-3 to O-5. The number of annual quotas the METOC community would need to fill requirements would almost triple, to 42, if each graduate educated officer completed only one utilization tour.[10] This revised quota requirement would be substantial given that there are only about 96 officers at grade O-3 in the METOC community. The next chapter includes a further discussion of the billet and educational quota structure for these two communities and their implications for ROI estimations.

CHAPTER FIVE
A RETURN-ON-INVESTMENT FRAMEWORK

Using the data and modeling results from Chapter Four and assumptions drawn from the military and civilian literature review, this chapter uses an ROI framework to analyze the benefits from funding graduate education. The underlying concept is straightforward: trading a one-time initial cost for providing education for a future benefit of needed knowledge for service in particular billets and available skills for service in all future billets. The **costs** are providing a billet for education for each officer for one to two years, paying tuition or substituting a proxy value for tuition when it is not paid directly. The **benefits** accrue from increased officer productivity due to the knowledge and skills gained and from filling billets that require this knowledge and these skills. It is not likely that a "cash-on-cash" return is achievable or measurable. In the detailed assessment below, we indicate when budget savings

[10] These estimations assume 95-percent retention rates.

might be achievable in future years, but it is an "economic" return that is actually assessed.

Aside from the individual investment, the annual cost overall needs to be taken into account. Given 550 new quotas each year for about 1.5 years of graduate education, the program requires a total annual investment of approximately $135 million. Furthermore, the billet management program, which handles approximately 4,500 P-coded billets and 500 Q-coded billets, is a $940 million annual investment in productivity ("readiness") that should be considered separately. Each of these is discussed below.

RETURN ON THE INVESTMENT IN EDUCATION

Variables Included

The variables that make up an ROI framework are outlined below. The analysis could be done for the Navy as a whole, separately for Navy URL and RL, or separately for a particular community. The data for URL and RL combined are presented below, and following that are examples for particular communities.

Inputs and Intermediate Calculations

- *Number of graduate education billets to be filled*. For URL and RL, approximately 4,500 billets require graduate degrees, and another 500 require graduate degrees and experience. These are the P- and Q-coded billets described earlier.
- *Annual quotas for graduate education*. There are 550 quotas each year.
- *Length of education*. The average is estimated between 1.5 years to 1.8 years. We used the lower bound of 1.5 years for our calculations, but this figure is easily modified in the analysis. This average and the number of annual graduate education quotas are key determinants of cost because a 1.5-year average for 550 new quotas each year translates into the equivalent of 825 annual school seats or billets that must be funded. A 1.8-year average would yield about 990 school seats to fund annually.
- Cost of one year of education. The typical student is an O-3, but some O-4s also attend. We used a programming rate for O-3 and O-4, heavily weighted toward O-3, of $140,000 for the cost of a billet in the student portion of the individual's account.[1] To that, we added an annual proxy tuition cost of $25,000, for an annual cost of $165,000 each for the number of school seats calculated above. Multiplying the two numbers (825 school billets at an annual cost of $165,000) yields the approximate cost of the education program, $135 million. Also, while the cost of one year of education (billet plus tuition) is $165,000, the cost per officer is about $245,000, assuming the 1.5 years of education.
- *Value of a billet and value of an officer*. The billets of interest (P and Q) are a mix of O-3 to O-6 billets. Weighting annual programming costs by the percentage of each grade in the billets yields an average annual figure of $157,000. We assumed that the amount programmed for the billet is the value of both the billet and the officer who fills it.[2]
- *Value of a billet requiring a graduate degree*. Assuming a 20-percent productivity gain from graduate education,[3] the value of a billet requiring a graduate degree is $188,000. The total value of all billets is thus $850 million for the 4,500 P-coded billets and an additional $90 million for the 500 Q-coded billets, for a total value of $940 million.

Benefits

- Value of an officer with a graduate degree. With the assumption of a 20-percent productivity gain, the officer who has a graduate degree provides $188,000 of annual value while serving in a billet requiring graduate education, or $31,000 more in value than an officer in that billet without graduate education.[4] This annual value is applied to the number of YOS in the billet, which we assumed to

[1] The Office of the Secretary of Defense publishes the composite standard pay and reimbursement rates for DoD military personnel annually. These provide data for calculating military manpower costs for program submissions and budget/management studies. The annual DoD composite rate, for each military service and enlisted and officer pay grade, includes average basic pay plus retired pay accrual, health accrual, basic allowance for housing, basic allowance for subsistence, incentive and special pay, permanent change of station expenses, and miscellaneous pay. As discussed earlier, we weighted the O-3 and O-4 Navy officer costs appropriately to determine the average cost for a typical billet. See Roth, 2009.

[2] The billet cost is derived from the DoD programming rates discussed earlier. As discussed in the literature review, economic returns of education are measured in the private sector through earnings differentials. Presumably, a rational firm pays what the person is worth in terms of productivity. We make the similar assumption here.

[3] This assumption is derived from the civilian literature discussed earlier. See Appendix D for an analysis of sensitivity to this assumption.

[4] Our analysis assumed all billets to be manned with an officer either with or without a graduate degree. "Gapped" billets (that is, those not filled by anyone) present issues for the Navy beyond the scope of this analysis.

be three. Longer service provides more value. Moreover, we assumed a 5-percent skill productivity differential (about $8,000) for all future billets that were not P or Q coded but in which an officer having a graduate degree might serve.

- *Increased retention.* Simple logic would mandate that officers who have graduate degrees would serve longer on average because their ADSOs following graduation would draw them closer to ten YOS, at which point vesting of retirement at the 20-year mark becomes a dominant consideration. Some of the literature discussed earlier has measured the retention increase, something that the evaluation chapter suggested should be done periodically. The benefit of increased retention is in reducing the annual costs of accessing and training new officers. These savings are potentially significant, as the studies cited described, but are not included in this initial assessment.

- *Reutilization*. The initial benefit described above is for first service in a billet requiring a graduate degree for an average of two years. Any subsequent use in P- or Q-coded billets provides additional annual value without additional cost. If the system were a steady state, any reutilization would also reduce the number of new quotas needed to fill billets, which would provide further savings.

Variables Not Included in the Analysis

A more-complete analysis might make assumptions and include at least two additional variables: depreciation and opportunity costs. Some of the literature discusses knowledge depreciation: the loss of knowledge when it is not used soon after it is gained. However, in our interviews, some indicated that even if not used, an officer educated in a particular field has an interest in staying abreast of that field through journal articles, symposia, etc., so depreciation might not occur. Opportunity costs affect both the officer and the organization. While in graduate school, the officer is forgoing an operational assignment for the same length of time, one that might have provided experience that could have improved his or her promotion potential. The Navy's opportunity costs derive from a possible loss of readiness from the officer being in school instead of an operational billet. It would be necessary to make assumptions about these costs because we are not aware of any studies that have analyzed them.

Also, as discussed above, we assumed longer service, given the graduate degree, but none of the benefits of increased retention, such as lower accession and training costs. We also did not account for the time value of money in this assessment.

Is There a Net Benefit?

Simple math would say that, for the Navy URL and RL, each graduate-degreed officer would need to serve an average of about 7.9 YOS in a designated billet to offset the $245,000 total educational cost at $31,000 in added value each year. Obviously, given detailing practices, the likelihood of this would vary by community. Introducing the variables of the skill productivity differential, increased retention, length of education, and reutilization increases the calculated benefit. For example, if at the end of education (at six YOS) an O-3 stays to 20 years and serves in one designated billet for three years and other billets for 11 years, the value (ignoring the time value of money) would be $31,000 for each of the three years plus about $8,000 for each of the other 11 years for a total of $181,000, which is less than the cost of education for 1.5 years of education but greater than the cost of one year of education. If the officer were to be utilized in designated billets twice for three years each, the benefit would be $186,000 plus $48,000 for a total of $230,000, or within 6 percent of the approximate cost of 1.5 years of education. Obviously, in these examples, we assumed that all newly graduated O-3s would stay exactly 20 years. In reality, some would leave earlier, and some would stay longer. Moreover, every officer provided graduate education would have to serve in designated billets for the benefit to accrue across all the URL and RL. An officer who served for 14 additional years after completing graduate education but who never filled a designated billet would provide $112,000 of value, and that is much less than the cost of the education provided. The overall ROI for the Navy thus depends heavily on the length of education and the usage rate of educated officers in designated billets.[5] Also, as stated above, we are not assessing the considerable savings in accession and training costs if officers who would otherwise have left would stay longer as a result of having been provided graduate education. That analysis is beyond the scope of this study, but Chapter Four outlined how this could be done and incorporated in the analysis.

[5] Sending officers to graduate education as early in a career as possible increases payback (potential years of utilization), assuming that the officers are retained.

EFFECTS ON SPECIFIC COMMUNITIES

We can use the modeling results from Chapter Four to assess the effects on two communities, SWOs and METOC officers, in more detail. For each, we make the simplifying assumptions of 1.5 years of education, three-year utilization tours, 14 years of additional service after education, $165,000 annual cost to educate (thus a per officer cost of $245,000 for the 1.5 years), a 20-percent knowledge and skill productivity premium while serving in validated billets, and a 5-percent skill productivity premium while serving in other billets.[6] Thus, the cost of education is fixed while, in the figures below, the benefits vary with the level of utilization.

Surface Warfare Officers

Because there are about six times more graduate education quotas for SWO officers (91) than for METOC officers (15), the annual cost to educate them is also six times larger. The break-even point for SWO occurs at about six total years of utilization for every officer provided a graduate education. Any level of utilization above that increases the return on the investment in education. Any level of utilization below that decreases the ROI. Current data show that only about 80 percent of graduate-degreed SWO officers who stay for 20 years serve at least one utilization tour. Many of the officers who do serve in designated billets generally serve in them for less than three years, and the billets often do not match their subspecialties.[7] Given this practice, it is not likely that any scenario would generate an ROI for their education without significant change in management of SWO officers.

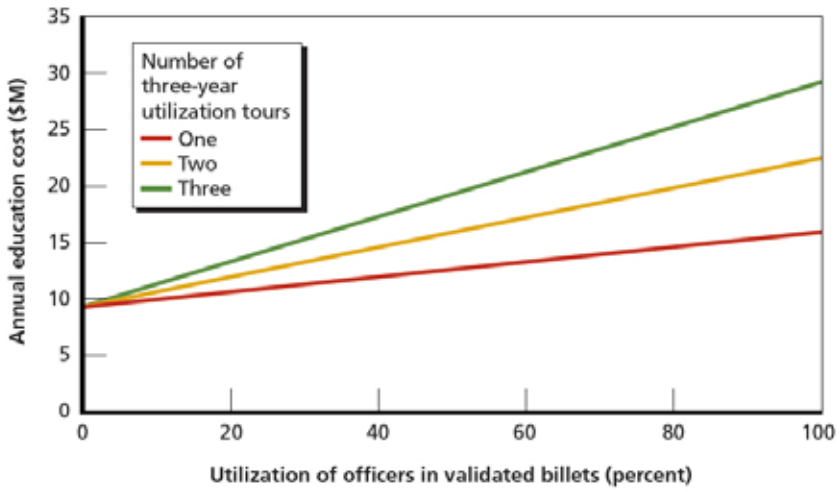
Figure 5.1 shows the returns for all SWO officers for three different levels of utilization. Costs are in millions of dollars, representing the cost of the entire SWO community of officers. The Navy breaks even at 100-percent utilization if officers serve two three-year utilization tours. That is to say, to break even, the Navy must have every SWO officer who gets funded graduate education serve two full utilization tours. The break-even point could also occur if only 70 percent of the officers had a utilization tour, but this would require a total of nine years of utilization.

METOC

The costs and benefits for METOC officers have the same relationships as they do for the SWO community but at lower dollar levels because of the lower number of quotas. However, METOC officers generally have high levels of utilization and repeat assignments in validated billets, making an ROI achievable. As shown in Figure 5.2, this breakeven return would occur at about six YOS for all officers in designated billets or at nine YOS for about 70 percent of officers.

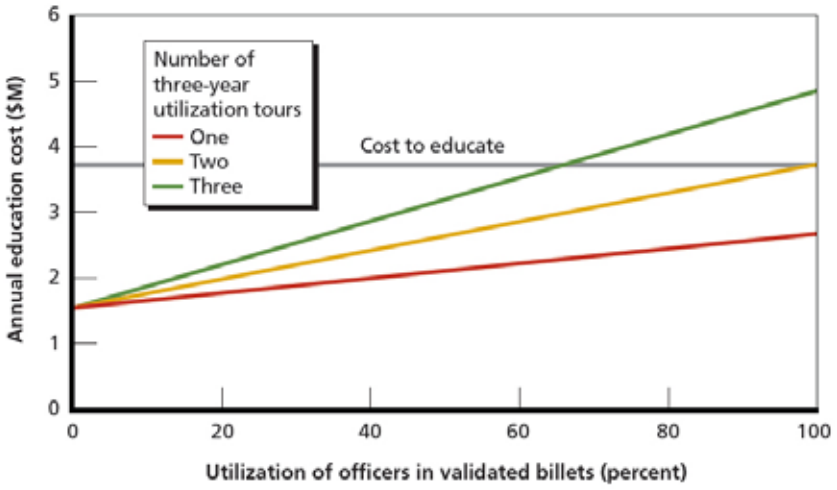
Figures 5.1 and 5.2 have different y-axes (cost) because one community has more quotas for education than the other community. But they have the same utilization lines because the ROI is indepen-

Figure 5.1
Return on Investment: Surface Warfare Officer Community



RAND MG995-5.1

Figure 5.2
Return on Investment: Meteorology and Oceanography Community



RAND MG995-5.2

[7] Data from Navy N15 show that, for the Navy overall, about 30 percent of officers with a master's degree and 20 YOS have served in a billet requiring that specific education.

dent of the numbers of educational quotas that drive cost. The return is dependent only on the utilization rate and productivity assumption (also given assumptions of completing education at seven YOS and staying to 20 years). That is, for any number of officers provided graduate educations, it takes about six years of use in validated billets to break even.

MANAGEMENT OF BILLETS REQUIRING GRADUATE EDUCATION

Overall, the Navy has about 4,500 P-coded and 500 Q-coded billets that require graduate degrees. Given the weighted grades and composite programming rates of the officers who serve in them, these billets have a readiness or productivity value of $940 million, of which $155 million is the premium for graduate education. Not filling one of these billets at all (gapping it) represents a readiness loss (or an opportunity forgone) of $188,000 for each such billet. If the billet is filled, but with an officer lacking the correct educational credentials, the loss is $31,000 for each such billet.

Current data suggest that, across the Navy, these billets are only accurately filled at about a 36-percent rate, indicating that the Navy is forgoing $109 million of readiness annually.[8] Assuming that the billet requirement is accurate (billets are subject to a zero-based review or validation annually), the Navy would have to either increase utilization significantly or increase quotas for graduate education to reduce the annual productivity loss to zero. There is a trade-off between increasing quotas to reduce the productivity loss and the cost of the additional quotas. Increased utilization in billets is also part of the trade-off, but even with much higher usage, it may not be possible to fill all the designated billets with appropriately educated officers.

From the previous METOC example, we know that six years of utilization in validated billets and seven years of use in other billets of all graduate-educated officers yields a break-even graduate education ROI. However, not all the P and Q billets may be filled at this level of use. The modeling described earlier indicated that more than two utilization tours of three years each would be needed to fill just the P-coded billets. Additional annual quotas would be needed to fill all P and Q billets at this level of use. Alternatively, nine years of utilization for each graduate-degreed officer both increases ROI for the educational benefit and reduces the cost of unfilled billets to near zero. Such levels of utilization might be feasible in this RL community, given the distribution of the Q billets in higher grades.

However, this is not the case for the SWO community. Detailing practices for SWOs would have to change significantly to institute repetitive service and high utilization in validated billets. In essence, SWO officers who have graduate degrees would need to become semispecialized in their subspecialties, which would decrease their opportunities for broadening assignments. Also, because the grade distribution of SWO P and Q billets skews toward O-4 and O-5 ranks, many officers would need to serve in positions one grade below their rank to fill all billets.

The various ratios of graduate education billets to all O-4 to O-6 billets and of quotas for graduation education to P and Q billets tell the tale for both communities. For METOC, 65 percent (213/326) of all billets are coded P or Q, but with 15 quotas, the ratio of billets to quotas is 14 (213/15). This implies that each graduate-degreed officer must serve 14 years of utilization in validated billets to fill all P and Q billets. But this may be feasible, given the high proportion of validated to overall billets and the especially high proportion of 79 percent (22/28) for O-6 billets and 81 percent (57/70) for O-5 P and Q billets to total billets for that grade.

For SWO, only 16 percent (533/3,414) of total billets are P and Q coded, but with 91 quotas, the ratio of billets to quotas is 5.8 (533/91). This implies that each graduate-degreed officer needs to serve slightly less than six years of utilization in a validated billet to have all billets filled. This is a lower rate of utilization than required for an education ROI. It is more likely that the SWOs could fill all designated billets than SWOs could use all officers in a designated billet to generate a return to their educations, but neither is probable with current management practices.

The differences are stark. A high percentage of all METOC billets are P and Q coded. High enough utilization of graduate-degreed officers to achieve an ROI on their education appears feasible. A small percentage of all SWO billets are P and Q coded. Not enough graduate degreed officers are utilized for a break-even ROI: however, enough are utilized to make filling all validated billets feasible if some SWOs specialize in these billets.

[8] Data from Navy N15 show that approximately 36 percent of designated billets are filled with officers holding master's degrees that directly or closely align to billet requirements. Thirty-six percent of designated billets are filled by officers that hold master's degrees. Thirty percent of officers have served in a billet requiring a master's degree (from the previous footnote).

SUMMARY: A TALE OF TWO COMMUNITIES

The SWO community educates enough officers to fill validated billets but neither fills the billets completely nor uses officers frequently enough in validated billets to generate a break-even ROI for the education provided. The METOC community uses officers in validated billets frequently enough to generate a return on the investment but, even so, lacks enough quotas to fill all validated billets. Common economic sense would suggest providing more quotas to METOC because in this community the marginal returns exceed the marginal costs.

CHAPTER SIX
FINDINGS AND RECOMMENDATIONS

This chapter summarizes the researchers' findings and provides recommendations to the Navy in terms of policy, culture, and monitoring and evaluation.

Findings

The new policy language and intent from the Office of the Secretary of Defense suggest a broader and more-extensive use of funded graduate education beyond educating for validated billets. In particular this is expanded to include educating for "future capabilities." At present, the Navy's graduate education management system and metrics for performance evaluation of that system focus on educating for "present needs." This focus is mainly due to a legacy of a bottom-up approach to managing officer quotas and billets; development of future capabilities implies a top-down process.

Graduate education provides technical skills and nontechnical competencies or "soft skills" which are valued in a wide range of Navy billets beyond billets which require graduate education. Although it is difficult to quantify returns to education, evidence from the literature suggests that positive organizational gains accrue from having a more educated workforce. Graduate education builds human and social capital that may lead to improved productivity, greater retention, and better performance in billets. Competencies gained in graduate education may compensate for lack of domain knowledge in certain billets.

Cross-service differences exist in graduate education philosophy, program parameters, utilization rates, and particularly in program management. The Navy has one of the largest requirements for graduate education in terms of quotas and validated billets. It also has the lowest utilization rates for officers who have graduate degrees among all the services. Moreover, even if better once-in-a-career utilization rates are achieved, validated billets and graduate school quotas are still mismatched in the Navy; fewer quotas are available than there are validated educational requirements.

Management of officers and billets that require graduate education varies between Navy communities, with pronounced differences between the RL and URL communities. The RL communities have proportionally more billet requirements, more-frequent utilization, and more-frequent reutilization than the URL communities. Cultural influences and career demands within the URL communities often impede demand for graduate school and service in validated billets.

Education execution, billet execution, and officer management are decentralized, and incentives and penalties for managing billets and quotas are not integrated. Community managers and education program managers often have different goals and metrics for assessing program success. Community managers focus on operational issues and gauge their success by how well they fill all the billets in the fleet. Education managers focus on filling graduate school quotas with qualified officers and on placing officers with the proper educational credentials in validated billets. At times these goals clash, with the result being unfilled billets or billets filled by individuals who do not have the requisite experience or qualifications.

The overall benefits in terms of ROI to the Navy from graduate education can be measured given certain assumptions. As Chapter Five indicated, it is possible to make some reasonable assumptions about the costs and benefits of a graduate education. Our approach presents a way to ascertain the costs and make some assumptions to determine benefits. These parameters can be adjusted in the model to identify elements that are particularly sensitive. An order-of-magnitude estimate is quite feasible, and more-precise assessments would be possible with better data.

The current metric, which specifies one utilization per career for each officer with a funded master's degree, as specified DoD and Navy instructions, will not give the Navy a break-even cash ROI within a 20-year career, given our assumptions. Recouping the investment in an officer's graduate education based on skills alone requires long service in billets requiring that education (multiple utilization tours) and even longer service in other billets.

Recommendations

Researcher recommendations are based on the findings of this monograph and cover three areas: policy, culture, and monitoring and evaluation.

Table 6.1
Recommended Modifications to Navy Graduate Education Policy

Paragraph	Current Policy Language	Recommended Policy Language
3	"Funded graduate education programs **are limited** to providing **sufficient officers** with subspecialties to fill validated billet requirements."	"Funded graduate education programs are offered **to develop a cadre of qualified officers** in areas where advanced proficiency and/or readiness are instrumental to the Navy's current mission or future capability."
4b	"Officers are educated to the graduate level specified by sponsors for optimum performance of duty **in the particular subspecialty area**."	"Officers are educated to the graduate level for optimum performance of duty in **all follow-on assignments** and in particular those assignments requiring the subspecialty designation."
4f(1)	"Officers who have received Navy funded graduate education will serve **one tour** in a validated subspecialty position as soon as possible **but not later than the second tour following graduation**."	"Officers who have received Navy funded graduation will serve **at least one tour** in a validated subspecialty position as soon as possible following graduation."

Policy

To shift graduate education toward development of future capabilities, the Navy needs to take a top-down approach. Initially, the Navy should review its existing graduate education instructions to verify that the language and intent are aligned with current DoD policy. Recent Navy guidance on graduate education *governance* (OPNAVINST 1520.42, 2009) reflects the new DoD policy more closely than previous versions, but the Navy's overall policy on funded graduate education (OPNAVINST 1520.23B) has not been revised since 1991. Navy policymakers should consider the intent of DoDI 1322.10: "Knowledge is good, and more is preferable." Researchers suggest modifying the existing language of OPNAVINST 1520.23B as outlined in Table 6.1. Once this is complete, Navy leaders need to effectively communicate the resulting policies to graduate education program managers, community managers, and officers.

The cost of graduate education can continue to be justified through service requirements; however, it may take an extremely long time to break even. But if the perceived value of graduate education is the increases in productivity, social capital, and decision quality that soft skills and general knowledge offer, the expense becomes an investment in future capabilities, a cost of doing business. If this becomes the goal, it seems justifiable to make the opportunity for graduate education competitive, targeted toward those most likely to stay in the service and advance to flag rank. In essence, the Navy would be broadly educating many to achieve future capabilities and an ROI from the few.

Culture

Increasing emphasis on graduate education as a benefit to the community and to the Navy-at-large will require a cultural shift for some Navy communities to overcome negative perceptions associated with career breaks for education and utilization assignments. In line with a top-down approach, community leaders need to set goals for graduate degrees, such as "90 percent of all officers advancing at the O-5 board will have a graduate degree." In tandem, community leaders need to develop goals for the types of graduate degree curricula that would support their anticipated capability requirements beyond current validated billet requirements.

The Navy can take some tactical steps to improve its utilization efficiency immediately by increasing utilization rates and reutilizing officers in validated billets, thus increasing net quantitative ROIs. These steps include incentives for more-integrated management of officer assignments at the community level and penalties for poor management of billets, quotas, and officers. These should vary by community to account for differences in billet structures and operational requirements. One option for penalizing poor management could be cutting graduate education quotas for communities that fail to meet certain threshold utilization rates for officers in validated billets. Community leaders should also seek to provide incentives for matching new graduates with assignments to validated billets to increase economic returns to their education investments. The Navy should consider the Air Force approach, which includes master's degrees in promotion considerations. Officers who are utilized in Q-coded billets increase the Navy's net benefit in terms of ROI; therefore, promotion boards and other incentive initiatives should also give exceptional consideration to "proven subspecialists."

Monitoring and Evaluation

The Navy should expand its utilization metric and enhance monitoring and evaluation of its graduate education program. The one-tour utilization metric needs expansion to account for additional benefits officers with graduate degrees bring the Navy. In particular, when these officers serve in nonvalidated billets, they may offer value that graduate education program managers to not currently capture. We suggest enhancing data collection and periodically evaluating graduate education programs under a hierarchy of outcomes (see Chapter Two). Appendix B offers some specific recommendations on improving data collection and analysis.

CONCLUSION

The Navy possesses the necessary mix of institutions

and curricula in its funded graduate education program to meet its present capability requirements. However, the total value of graduate education to the Navy is not being captured by the metric of one utilization tour as defined in current Navy policy. In fact, given the current timing for graduate school and the typical career progression for officers, one utilization tour per graduate-degreed officer does not recoup the cost of that degree within a 20-year career. We found that both the officer and the Navy benefit from the knowledge and skills graduate education offers. The Navy benefits from the officer's improved productivity, better decision making, and increased retention. Some of this value can be monetized, allowing the costs and benefits to be estimated using enhanced data collection methods and reasonable assumptions. Recent shifts in DoD policy language and intent suggest that the Navy should expand on the one-tour utilization metric to use a more-nuanced assessment of the value of graduate education for the Navy's officer corps, especially with respect to future capabilities.

APPENDIX A
MASTER'S DEGREE OPPORTUNITIES IN THE NAVY

Naval Postgraduate School (NPS)

NPS, currently located in Monterey, California, began as a postgraduate engineering school for the USNA and became a fully accredited graduate institution in 1955. Its mission is to "provide relevant and unique advanced education and research programs to increase the combat-effectiveness of the U.S. and Allied armed forces, and to enhance the security of the United States" (NPS, 2005). It currently supports about 2,000 graduate students enrolled in master's and doctoral programs. At any one time, about one-third of the students come from the U.S. Navy and Naval Reserve, but NPS resident and nonresident programs are available to all service members and to some government civilians and defense contractors. DoD finances the school and its programs directly, along with sponsorship funds.

NPS offers 43 degree programs focusing primarily on engineering, science, technology, national security and business. Out of the 924 degrees awarded in 2008, there were 15 doctorates in engineering, 169 MBAs, 565 master of science degrees, and 175 master of arts degrees. Most naval officers complete a master's degree at NPS as an O-3 during their first shore tour. Officers who are interested in the program must contact their detailers, who will determine whether his or her academic background and professional qualifications are suitable for the desired program. Prospective candidates must have a bachelor's degree from an accredited institution with a grade point average higher than 2.2 on a 4.0 scale.

In 1998, OPNAV estimated total annual military pay (salaries, benefits, and housing) for an NPS-resident officer of $63,300; for a full-time an officer at a civilian institution of $72,300 (Gates et al., 1998). When taking into account program duration and academic fees, OPNAV estimated the total cost of an NPS master's degree to be $231,024, and the weighted average for a selection of 29 civilian institutions naval officers typically attended was $210,112 (Gates et al., 1998).[1]

Immediate Graduate Education (IGE)

A select number of officers may pursue IGE after completing their undergraduate degrees. Some of these officers will receive partial scholarships, in which the granting organization pays for tuition costs but the Navy pays the officer's full salary, benefits, and housing (if the scholarship does not include housing). Some examples are the Rhodes and Marshall Scholar programs. The Navy also fully funds various IGE programs for officers to allow them to complete their master's degrees at NPS or at a civilian university immediately after commissioning.

For IGE and scholarship programs an officer incurs a service obligation of five years for programs less than 20 months and six years for programs greater than 20 months. This service obligation may be served concurrently with any other service obligations (Harvey, 2006).

VGEP is available to only USNA midshipmen, accommodating up to 20 per year. Students accepted into the program must have validated or completed enough of their coursework by their senior year at the academy to be able to pursue part-time work toward a graduate degree at a nearby civilian university. In addition to being selected by the USNA, the midshipman must also apply to and be accepted by the civilian university's degree program. The student will continue to be assigned to the academy through the duration of the program for administrative purposes and must be able to complete the degree coursework within seven months of graduation from the academy. Authorized fields of study are those that lead to a Navy subspecialty qualification.

[1] The most expensive school was estimated to be the California Institute of Technology, at $387,947; the cheapest was the University of Maryland, College Park, at $175,091.

Table A.1
Politico-Military Master's Programs

University	Degree	Program	Time (years)
Georgetown	MA	Security Studies Program	1
Harvard	MPP	Public Policy	2
	MPA	Public Administration	2
	MPA/ID	Public Administration and International Development	2
	MC/MPA	Midcareer MPA program	1
Johns Hopkins	MA	International Relations	2
	MIPP	International Public Policy	1
Stanford	MA	International Policy Studies	1.5
	MA	International Relations	1.5
Tufts	MALD	Master of Arts in Law and Diplomacy	2
	MA	Fletcher School	1

SOURCE: OPNAVINST 1500.72F, 2007.

Costs to the government are up to $10,000 in tuition fees and education expenses, as well as regular in-grade active-duty pay and benefits.

Some officers may be preselected to attend graduate school at the time of their commissioning through the Navy Burke program, which provides deferred opportunities for selected URL officers to obtain graduate degrees in science and engineering fields at NPS. Every year, a select number of USNA, Reserve Officer Training Corps, and Seaman-to-Admiral (STA-21) officer candidates with proven academic performance and leadership potential are chosen for this program prior to commissioning. Unlike the IGE program, the selected officers will first complete a normal operational assignment and will obtain warfare qualification before attending graduate school. During their operational tours, they will need to be in communication with their detailers to discuss their curricula, which is required to be technical.[2]

Burke candidates are required to serve a maximum of three years in their warfare specialty or in a subspecialty utilization tour. Burke candidates who successfully complete their master's programs and have continued high professional performance in their follow-on tours are also eligible to apply for a Navy Burke assignment to a doctoral program.

Politico-Military Master's Program

The Politico-Military program is intended to allow active-duty URL officers to develop a subspecialty in political and affairs and strategic planning through master's degree programs in public policy, security studies, or international relations at highly selective universities.[3] Program duration varies by degree and institution, as shown in Table A.1. Officers in the program are full-time students in duty-under-instruction status. Approximately four quotas are funded for this program annually.

All URL officers who have not already completed a funded graduate degree program and are in grades O-3 through O-5 are eligible for the Politico-Military program. Interested officers must apply to the Navy Personnel Command before the Fellowship Program Selection Board convenes in October or November. The board bases its selection on "career performance, academic qualifications, promotion potential, overall fleet requirements, needs of the Navy and overall billets" (OPNAVINST 1500.72F). Officers completing the program will be eligible to receive a 2000P-series subspecialty code, which denotes a master's degree in the area of national security studies.

APPENDIX B
DATA COLLECTION AND ANALYSIS RECOMMENDATIONS

The following are recommended specifications for the personnel file that would be required to conduct a more thorough ROI analysis for funded graduate education in the Navy. The personnel data file should be longitudinal, with observations occurring either on a monthly basis (e.g., active-duty master file) or as transactions take place (e.g., work experience file). The primary variable of interest would indicate that an officer has earned a new master's degree. Most simply, this could be an education variable that changes value from "bachelor's degree" in one observation to "master's degree" in the next. More precisely, a variable indicating the officer's secondary occupation contains, in the fifth position, a letter that takes on the value P or Q if the officer has

[2] If the degree program is not available at NPS the officer may put in a request to attend a civilian university.

[3] These universities include Harvard, Tufts, Johns Hopkins, Stanford, and Georgetown.

Table B.1
Sample Individual Work Experience File

Social Security Number	Component	Grade	Occupation			Education	Transaction Date	
			Primary	Duty	Secondary		Beginning	End
123456789	Active	O-2	1310DU	8651	6042	K	12/1/89	2/1/91
123456789	Active	O-3	1310DU	8653	6042	K	2/1/91	9/1/92
123456789	Active	O-3	1310DU	8653	6042	K	9/1/92	3/1/93
123456789	Active	O-3	1310DU	8653	6042P	N	3/1/93	1/1/94
123456789	Active	O-4	1310DU	9085	6040P	N	1/1/94	10/1/95
123456789	Active	O-4	1310DU	9087	6040P	N	10/1/95	2/1/95
123456789	Active	O-4	1310DU	9085	6040P	N	2/1/95	5/1/96
123456789	Reserve	O-4	1310DW	9085	6040P	N	5/1/96	12/1/96
123456789	Reserve	O-4	1310DW	9087	6040P	N	12/1/96	11/1/98
123456789	Reserve	O-5	1310DW	9087	6040P	N	11/1/98	5/1/00

earned a master's degree.

The following example (Table B.1) illustrates a hypothetical officer who earned a master's degree in March 1993, as shown by both the education and secondary occupation variables. A new transaction is generated every time the officer changes grade, active or reserve component, occupation, or education level. A file with monthly episodes would provide the same level of detail as a transaction-based file like this (which resembles the Work Experience File Database).

Several possible measures could yield information about the Navy's return on investing in an officer's education. The first is YOS after earning a master's degree. In the example above, the officer completes a master's degree in March 1993 and separates from active duty in May 1996, suggesting that the active component of the Navy benefited from the officer's degree for two years and two months. Further, the officer remained in the reserve component from May 1996 to May 2000, and these four years could also be interpreted as part of the ROI. At least three versions of YOS could be considered measures of the return:

- YOS beyond degree award
- YOS beyond ADSO
- career YOS (active-duty and reserve service).

To measure YOS beyond the date the degree was awarded, averages should be computed for those who have earned a master's degree and compared against those who have not. Controls should be based on YOS at the time the degree was completed. So, if the average officer who obtains a master's degree does so after five YOS, the amount of time spent on active duty beyond five YOS is the appropriate measure for those who do not obtain a master's degree.

A similar computation would be done to measure YOS beyond an officer's ADSO and total career YOS. These do not require an initial determination of the starting point for measuring YOS. Rather, the average number of service years beyond ADSO (or total YOS) should simply be compared for those who have earned master's degrees and those who have not. Regardless of the YOS measure, the data could be further disaggregated by such variables as occupation (i.e., compare YOS for oceanographers who have earned a master's degree with those who have not).

A second measure that provides information on the Navy's return from investing in an officer's education is promotion speed. In the data example above, the officer earns a master's degree in March 1993 and is promoted to lieutenant commander in January 1994 after spending two years and 11 months as a lieutenant. Four years and ten months later, he is promoted to commander. To determine whether officers who have earned master's degrees are promoted more quickly than those who have not, the average amount of time spent in each pay grade should be computed for those who have earned master's degrees and compared to those having only bachelor's degrees. The relevant comparisons are the pay grades beyond the officer's rank at the time of degree award. So, for officers who earn a master's degree as a lieutenant, comparisons should be made for the years spent at the ranks of lieutenant commander and above. As with the YOS measures, a finer disaggregation of the data, by occupation, is certainly possible.

Finally, the effectiveness and efficiency of degree utilization provide information on whether investing in an officer's education helps the Navy better match individual skills with billet needs. The data set described above indicates which individuals have P-coded occupations, and this information could be used to determine which billets have been filled by officers having the appropriate skills. Additionally, the secondary occupation code contains information on the officer's subspecialty, as well as details on graduate education ("P" in the fifth position of the field). A computation of the amount of time that passes between graduation and reassignment to a different subspecialty (from 6042 to 6040, ten months after completion of the master's degree in the hypothetical example above) indicates how efficiently the Navy is making use of its new graduate-degreed officers to fill billets.

APPENDIX C
MODEL ASSUMPTIONS AND LIMITATIONS

Table C.1
Model Assumptions and Limitations

Assumptions	Grade	URL SWO (%)	RL METOC (%)
Timing of master's	O-3	95	95
	O-4	5	5
Duration of master's program		18 months	18 months
Utilization tour length		2 years	3 years
Promotion rates	O-4	0.92	0.90
	O-5	0.90	0.87

NOTES: Utilization occurs at earliest opportunity. Many opportunities exist over a career to utilize graduate education in a P-coded billet.

LIMITATIONS:
1. Addresses general subspecialty fill possibilities not exact subspecialty matches.
2. Does not include Q-coded billets.
3. Excludes officer accessions from other communities (expected to be very small).
4. Does not include officers who received graduate education and subspecialty before O-3 or from unfunded sources.
5. Does not extend beyond O-5.

We used iThink software to model career progressions for officers with graduate degrees. We started with a pool of school quotas and billets that needed to be filled at each grade from O-3 through O-5. Officers first entered the model at grade O-3, when they started graduate school. From this steady-state stock of graduate-educated officers, we were able to estimate billet fill possibilities at every grade, given certain community-specific assumptions about promotion and tour length. Table C.1 outlines the these assumptions and the model limitations.

APPENDIX D
RETURN-ON-INVESTMENT SENSITIVITY ANALYSIS

For the ROI analysis, we assumed that graduate education supplied a 20-percent productivity gain in validated billets, based on the range of estimated productivity gains that emerged in the literature. The 20-percent gain is actually broken down into two parts: three-fourths (15 percent) of the productivity gain comes from domain knowledge gained in the degree, and one-fourth (5 percent) comes from skills or competencies gained in the course of the education. The 15-percent gain applies only to validated billets, while the 5-percent gain applies to all billets.

The literature estimates a broad range of productivity gains that vary by degree type, institutional quality, and other factors. Therefore, we conducted a sensitivity analysis to examine how varying the productivity rate affects the ROI assessment for funded graduate education in the Navy. We varied our base rate by one-fifth in either direction while keeping the knowledge-to-skill ratio the same to examine total productivity gains at 16 percent (12-percent knowledge and 4-percent skills) and 24 percent (18-percent knowledge and 6-percent skills).

Figure D.1 demonstrates how varying the productivity rates influences the number of years required in validated billets to achieve positive ROIs for graduate education. The ROI break-even point in terms of years of use in validated billets is sensitive to the estimated productivity gain. If we assume a productivity gain of only 16 percent, an officer would need to complete almost nine years (three tours) in validated billets for the Navy to recoup its cash outlay

Table D.1
YOS Needed After Degree to Reach Break-Even Point

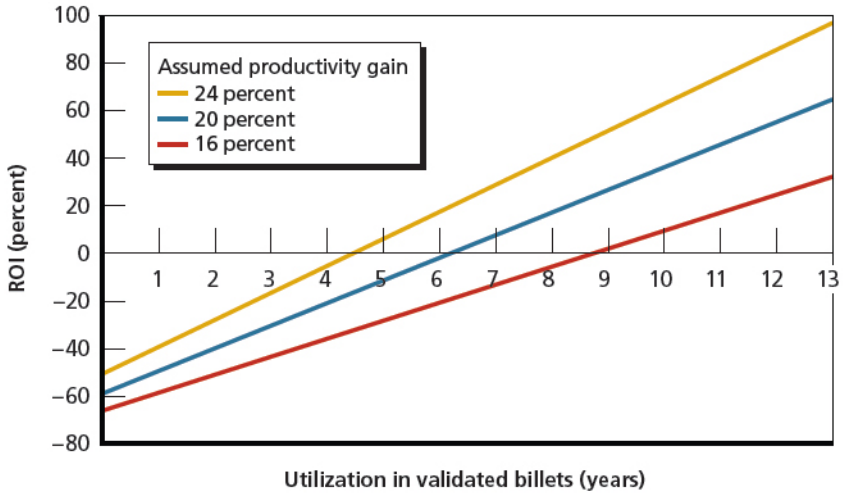
Years in Validated Billet	Total Productivity Gain (%)	Total YOS Needed	Likely Rank
3	16	30	Senior flag[a]
3	20	23	CAPT
3	24	17	CDR, CAPT
6	16	21	CDR, CAPT
6	20	14	CDR
6	24	8	LCDR
9	16	12	LCDR, CDR
9	20	9[b]	LCDR
9	24	9[b]	LCDR

[a] Given seven YOS at education completion, officer would need to make senior flag rank to stay to 37 YOS.
[b] Staying for a total of 16 years (nine additional years of utilization beyond education) provides a positive ROI.

on funded graduate education. With a 24-percent productivity gain, the officer would need to complete only four years in a validated billet.

Looking at it a different way, we can vary both the number of years the officer spends in utilization billets and the estimated productivity gain to determine the number of YOS required after graduation for the Navy to recoup a cash return on the cost of a master's degree. Table D.1 estimates the YOS and likely rank of the officer at the breakeven point for various rates of productivity and years in validated billets. No matter what productivity rate is used within our estimated range, an officer who does only one utilization tour must serve longer than the typical 20-year career for the Navy to see a positive cash ROI for graduate education. In fact, unless we can assume a 24-percent productivity gain, the Navy will not recoup its investment in a 20-year career, even if the officer completes two utilization tours following graduation.

Figure D.1
Productivity Rate Assumptions Affect Return-on-Investment Possibilities



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TITLE

Proposed White Paper to Secretary of the Navy

SOURCE

Third Draft, NPS Internal Document, Unknown Author, Unknown Date

ABSTRACT

This white paper assesses the feasibility of privatizing the Naval Postgraduate School (NPS) and offers pro and con arguments for all possible options. NPS' perspective on the quality of future graduate education that the Secretary of the Navy would want to provide officers as well as suggestions to improve NPS' cost-effectiveness are reviewed.

EXCERPTS

"The only two institutions offering defense-specialized Master's and doctoral degree programs are the Naval Postgraduate School and the Air Force Institute of Technology (AFIT). Although the Air Force attempted to close AFIT this decision was reversed in recognition of the fact that AFIT fulfills an indispensable function."

"We take pride in the statement that NPS is the 'Navy's flagship university' which offers comprehensive high-level curricula tailored to specific Navy needs … You seem to agree with the arguments in favor of retaining NPS because your current initiative examines only the question whether a civilian university can be found which will operate NPS at reduced cost for the Navy while retaining current NPS faculty, students, and programs."

"We submit that NPS is a Category I university" [doctoral level institution]. "Indeed, in a number of disciplines NPS is among the internationally recognized leaders. This is especially true for the meteorology and operations research programs offered at NPS."

"We suggest that the real cost savings accruing to the Navy by operating a defense-specific Category I university are often overlooked. Officers who received the proper high-level education can contribute significant cost savings in their follow-on assignments … Since it is likely that cost savings of the type and magnitude listed in Enclosure IV can be found and documented every year a good case can be made that the Navy's return on investing in officer education at NPS is excellent. Therefore, we respectfully suggest that this aspect ought to be considered in any objective cost/benefit analysis of officer graduate education at NPS."

"We have been remarkably successful in building up a unique defense-oriented research program. The numbers speak for themselves. Our research program is funded by various Navy, DOD and other sponsors at a level of approximately $39M … while the teaching funds supporting formal courses amount to only $42M. As a consequence, the special faculty expertise, experimental test facilities, unique defense-related computer programs etc. are made available to the officer students in regular courses and thesis projects without the use of O&MN teaching funds. Indeed, 42% of the faculty time is paid from reimbursable research fund … In fact, the Navy receives the services of a think tank

staffed by some 400 highly qualified experts specializing in military matters at substantially reduced cost."

Recommendations for improving the cost-effectiveness of NPS: "Increase the student enrollment by admitting civilian students … Examine the possibility of merging NPS and AFIT into a single Defense Institute of Technology … Reduce the number of courses and curricula offered at NPS."

CD REF NO. PW–36

Proposed White Paper to Secretary of the Navy

OBJECTIVE

Your recent initiative to assess the feasibility of privatizing the Naval Postgraduate School (NPS), and the budget cuts imposed on NPS, indicate to the faculty that you are considering major changes in the delivery of graduate education for Naval and Marine Corps Officers. It is the purpose of this white paper to provide you with our perspective on the quality and quantity of graduate education you may wish to provide for future Naval/Marine Corps Officers. In preparing all possible options for your consideration we attempted to be entirely neutral on the question whether a specific option will lead to the curtailment or closure of NPS. Having accumulated many years of experience in providing graduate education for your officers we are merely trying to provide you with pro and con arguments for any particular option.

NEED FOR GRADUATE EDUCATION

As pointed out in the position paper prepared by the NPS Administration (Enclosure I), the Navy is sending mixed signals to its officer corps about the importance of graduate education. For the following discussion we assume that you agree with the statement that there is a requirement to provide graduate education for a certain number of officers but that the level of graduate education and the percentage of officers receiving such education remain to be determined.

CATEGORIES OF UNIVERSITIES

For the following discussion it is important to distinguish between three categories of universities offering graduate-level education. The American Association of University Professors (AAUP) defines:

Category I Universities (Doctoral Level Institutions) are characterized by a significant level and breadth of activity in a commitment to doctoral-level education as measured by the number of doctoral recipients and the diversity in doctoral-level program offerings.

Category IIA Universities (Comprehensive Institutions) are characterized by diverse post-baccalaureate programs, but do not engage in significant doctoral-level education.

Category IIB Universities are characterized by their primary emphasis on general undergraduate baccalaureate-level education.

GRADUATE EDUCATION OPTIONS

We respectfully suggest that you should distinguish between four basic options, namely to provide the officer with an opportunity to acquire:

I) a Master's degree from ANY university in any field of study

II) a Master's degree from a Category IIA university

III) a Master's degree from a Category I university

IV) a Master's degree from a high-quality university which also offers military-relevant courses and research topics

OPTION I: MASTER'S DEGREE FROM ANY UNIVERSITY IN ANY FIELD

In this option the requirement for particular educational skills to fill billets is dropped. The purpose of graduate education merely is the further development of the officer's intellectual abilities. Given the vast selection of universities available in the United States, ranging from top research universities to marginal teaching universities, it is likely that an officer can acquire a Master's degree in four to six

quarters with minimum undergraduate qualifications. It is clear that there is no need for NPS if you choose this option.

OPTION II: MASTER'S DEGREE FROM A CATEGORY IIA UNIVERSITY

In this option you may wish to retain the requirement for particular educational skills to fill particular billets. Therefore, you may wish to send a certain number of officers to certain Category IIA institutions to acquire M.S. degrees in various disciplines It is our experience that only relatively few officers qualify for direct entry into a high-quality Master's program. Hence, depending on the entry standards, it may take the officer up to three quarters of refresher undergraduate courses before being admitted to graduate studies. The time needed to complete the M.S. degree will not be significantly different from that needed at NPS. The faculty expertise available at Category II universities typically is limited to mastery of the fundamentals. Hence the officers are likely to receive a good education in the fundamentals of the chosen discipline but no/little exposure to advanced research problems and special defense-related matters.

OPTION III: MASTER'S DEGREE FROM A CATEGORY I UNIVERSITY

As already stated above, it is our experience that only relatively few officers qualify for direct entry into a Master's program offered by a Category I university. This is especially true in the engineering fields. Many officers need to take up to three quarters of refresher undergraduate courses before being admitted to graduate studies. NPS has developed special expertise to provide this refresher undergraduate education in the most time and cost efficient manner. If you should choose to send the officers to Category I universities for their graduate studies, it remains to be examined whether it is more cost-effective to retain NPS or to award the refresher undergraduate education to a Category II university.

OPTION IV: MASTER'S OR DOCTORAL DEGREE FROM A CATEGORY I OR CATEGORY IIA UNIVERSITY WITH DEFENSE-SPECIALIZED PROGRAMS

The only two institutions offering defense-specialized Master's and doctoral degree programs are the Naval Postgraduate School and the Air Force Institute of Technology. Although the Air Force attempted to close AFIT this decision was reversed in recognition of the fact that AFIT fulfills an indispensable function.

THE NAVAL POSTGRADUATE SCHOOL

We now attempt to summarize the arguments for or against closing or privatazing the Naval Postgraduate School.

ARGUMENTS TO CLOSE NPS

As pointed out in Option I, there is a good case to be made for closing NPS if you only wish to provide an unspecified level and type of graduate education for your officers.

There is only a weak case for closure if you wish to provide Master's and doctoral programs at Category I universities because many officers will be unable to complete their programs within the time constraints imposed by other naval career demands.

ARGUMENTS TO RETAIN NPS

We take pride in the statement that NPS is the "Navy's flagship university" which offers comprehensive high-level curricula tailored to specific Navy needs. We do not want to list the specific arguments substantiating this statement, but merely refer to the point paper prepared by the NPS Administration, Enclosure II. You seem to agree with the arguments in favor of retaining NPS because your current initiative examines only the question whether a civilian university can be found which will operate NPS at reduced cost for the Navy while retaining current NPS faculty, students, and programs.

NPS FACULTY COSTS

Since your initiative to privatize NPS appears to be motivated by cost considerations we respectfully suggest that the distinction between Category I and Category IIA institutions is extremely important. We submit that NPS is a Category I university. Indeed, in a number of disciplines NPS is among the internationally recognized leaders. This is especially true for the meteorology and operations research programs offered at NPS. Furthermore, this is demonstrated by the doctoral degrees awarded in most NPS curricula and the quantity and quality of the research output published in the leading professional journals. As a matter of fact, the Navy has now instituted the Professional Military Professor program at NPS for the specific purpose of educating

a (small) number of officers to serve as professors at the Naval Academy. However, the faculty workload model used at NPS is the one used at Category II universities. Since no or little original research and no doctoral thesis advising is expected at Category II universities, the teaching loads are typically twice as high than at Category I universities. NPS faculty members are compelled to procure their own research funds from various research sponsors to buy release time from heavy teaching loads. We have been remarkably successful in building up a unique defense-oriented research program. The numbers speak for themselves. Our research program is funded by various Navy, DoD and other sponsors at a level of approximately $ 39M (Enclosure III provides a more detailed overview) while the teaching funds supporting formal courses amount to only $ 42M. As a consequence, the special faculty expertise, experimental test facilities, unique defense-related computer programs etc. are made available to the officer students in regular courses and thesis projects without the use of O&MN teaching funds. Indeed, 42% of the faculty time is paid from reimbursable research funds.

COMPUTATION OF FACULTY COSTS AT CATEGORY I UNIVERSITIES

Faculty at Category I universities typically are required to teach both at the graduate and undergraduate-level. This makes it possible to spread the faculty costs over a much larger student body than is possible at a pure graduate school such as NPS. Therefore, cost comparisons with civilian Category I universities must be done quite carefully. We submit that the Navy receives a real bargain by imposing the Category II workload model while insisting on Category I faculty output. In fact, the Navy receives the services of a think tank staffed by some 400 highly qualified experts specializing in military matters at a substantially reduced cost.

POSSIBLE EFFECTS OF NPS PRIVATIZATION

If NPS were to be administered by a Category I university it is likely that the Category I faculty workload model would have to be used. This would require substantially higher faculty costs (apart from the higher salaries paid to Category I administrators and full professors). Furthermore, it is doubtful that the present strong defense-related research program could be maintained due to the difficulties in transferring research funds (other than OR to a civilian university.

On the other hand, if NPS were administered by a Category II university, it is likely that the Category II heavy teaching loads would be imposed without the possibility of "buyouts" from such teaching loads. As a result, such an arrangement will hasten the departure of high-quality faculty who wish to pursue original research and the Navy and DoD will be deprived of a pool of highly competent experts who are specializing in defense-related research and consulting.

OBJECTIVE COST/BENEFIT ANALYSIS OF OFFICER GRADUATE EDUCATION

At present, it is quite customary to base cost savings on very narrowly defined criteria. We suggest that the real cost savings accruing to the Navy by operating a defense-specific Category I university are often overlooked. Officers who received the proper high-level education can contribute significant cost savings in their follow-on assignments. Unfortunately, no systematic effort is made to document such cases. However, we refer you to two examples listed in Enclosure IV. We emphasize that such savings are likely to occur only if the officer received a Category I education. Since it is likely that cost savings of the type and magnitude listed in Enclosure IV can be found and documented every year a good case can be made that the Navy's return on investing in officer education at NPS is excellent. Therefore, we respectfully suggest that this aspect ought to be considered in any objective cost/benefit analysis of officer graduate education at NPS.

RECOMMENDATIONS FOR IMPROVING THE COST-EFFECTIVENESS OF NPS

The cost-effectiveness of any university is directly linked to the number of students enrolled in any given curriculum. At NPS the student enrollment has declined by more than 30 percent since the end of the Cold War and, as a consequence, the cost-effectiveness of NPS has suffered. Narrowly defined cost-effectiveness considerations therefore would suggest that significant changes in NPS operations are in order. However, before accepting such a conclusion the question must be answered whether the percentage of officers currently receiving graduate education is sufficient to guide the revolutionary changes in Navy systems and operations required to meet the challenges of the new century. The decisions made by officers sensitized to new technological opportunities may produce benefits which far outweigh the cost of an increased number of officers receiving graduate education. We therefore suggest as the first option:

1) Increase the number of officers receiving Category I graduate education.

> If there is no possibility to increase the number of officers available for graduate education, you may wish to consider the following options to improve the cost-effectiveness of NPS:

2) Increase the student enrollment by admitting civilian students. California has an urgent need to expand its university systems. In fact, the University of California at Santa Cruz (only thirty miles north of Monterey) is in the process of developing an engineering school. It would seem to be in the national defense interest as well as the overall national interest to find an arrangement with the University of California which permits the enrollment of civilian students at NPS. Such an arrangement will provide additional tuition income for NPS and thus lower the cost per Navy student.

3) Increase the student enrollment by finding an arrangement with the Air Force and Army to enroll more Air Force and Army students at NPS. Examine the possibility of merging NPS and AFIT into a single Defense Institute of Technology.

4) Reduce the number of courses and curricula offered at NPS. Consolidate the existing curricula into just a few core curricula, augmented with only a few high-level courses requiring special faculty expertise. Eventually, delete the thesis requirement. This action will enable significant reductions in faculty and facilities. The elimination of most special courses and of the thesis requirement will cause the transformation of NPS from a Category I university to a Category IIA university. As a consequence, the research-oriented faculty will depart and the faculty expertise available to the Navy will be greatly reduced.

TITLE Letter from C. S. Faller to Mr. Alan Richmond

DATE Sept. 26, 2011

CD REF NO. PW–37

September 26, 2011

)ear Mr. Richmond,

I received your note today and I wanted to 'rite to thank you for sending me a copy of your 'eature on the USS JOHN C. STENNIS.

The production is amazing and I know that it 'ill provide valuable information to everyone who 'atches it. I truly enjoyed hosting you during our .ransit. I am glad it was a great experience for 'ou as well!

Best wishes to you and I look forward to 'atching the future parts of your feature.

Best regards,

C. S. FALLER
Rear Admiral, U.S. Navy
Commander, Carrier Strike
Group THREE

'R ALAN RICHMOND
UNIVERSITY CIRCLE ROOM 130
ONTEREY CA 93943

TITLE Letter from C.S. Faller to Adm. Dan Oliver

DATE Aug. 26, 2011

CD REF NO. PW–38

August 26, 2011

Dear Admiral Oliver,

I want to express my appreciation for the valuable training and education provided by the Regional Security Education Program (RSEP) team while aboard USS JOHN C. STENNIS. RADM(Ret) Steve Loeffler's superb team of experts specifically tailored their briefs to our upcoming deployment to the SEVENTH and FIFTH Fleet AORs.

All of the professors were gracious guests with the work ethic of the most seasoned Sailor, sometimes briefing for 12 hours a day. They were all extremely accommodating to our shifting schedule.

I would like to give a Bravo Zulu to RADM(Ret) Loeffler, Dr. Rook, Dr. Scobell, CDR Wang, Mr. Jacobo, Mr. Richmond and especially Dr. Rubin who is the obvious subject matter expert in his field. Thank you for NPS' continued support of the Fleet through valuable programs such as this.

Very respectfully,

C. S. FALLER
Rear Admiral, U.S. Navy
Commander, Carrier Strike
Group THREE

VADM(Ret) Daniel T. Oliver

TITLE Letters from Ambassador of Lebanon and the President of the Republic of Lebanon

DATE January 4, 2012

CD REF NO. PW–39

Embassy of Lebanon
Washington, D.C.

Ref. No. 4
File No. 2/3

January 4, 2012

Dr. Francois Melese
Professor of Economics & Executive Director
Defense Resources Management Institute (DRMI)
Naval Postgraduate School
Monterey, CA 93943

Dear Dr. Melese,

I am enclosing herewith the copy of a letter addressed to yourself by the President of the Republic of Lebanon, H.E. General Michel Sleiman with regards to the participation of Colonel Elias Aad and Colonel Khalil Jbeili in a course at your institute.

With my best wishes,

Sincerely,

Antoine Chedid
Ambassador of Lebanon

2560 28th Street, N.W. Washington, DC 20008 ♦ Tel: (202) 939-6300 ♦ Fax: (202) 939-6324 ♦ e-mail: info@lebanonembassyus.org

Presidency
of the
Republic of Lebanon

Telegram

Mr. Francois Melese

Executive Director of the Defense Resources Management Institute

Dear Mr. Melese,

I have received with appreciation your letter informing me about the participation of Colonels Elias Aad and Khalil Jbeili in a course in the management of defense resources at your institute of which I have very good memories. Such courses convey the importance that you grant to the relations between the Lebanese Army and the Defense Resources Management Institute.

It is with appreciation that I recall the period I spent in the institute where I attended a military session; I would like to thank you for your letter and express my best wishes for the holidays. I hope that our constructive cooperation will be maintained, and would thus enhance the capabilities of the military institution in Lebanon in preserving our country's sovereignty and security.

General Michel Sleiman

President of the Republic of Lebanon

Baabda January 4, 2012

TITLE Letter from Mayor of Chicago, Rahm Emanuel to CHDS Director Woodbury

DATE December 15, 2011

CD REF NO. PW–40

OFFICE OF THE MAYOR

CITY OF CHICAGO

RAHM EMANUEL
MAYOR

December 15, 2011

Mr. Glen Woodbury
Director
Naval Postgraduate School, Center for Homeland Defense and Security
700 Dyer Road, Building 245, #371
Monterey, California 93943

Dear Director Woodbury:

I want to take this opportunity to thank you and the Naval Postgraduate School's Center for Homeland Defense and Security for hosting the "Homeland Security Executive Education Seminar" for the City of Chicago on December 7, 2011.

The panel of experts provided an educational forum to enhance response activities among the City's Cabinet members and leaders from Cook County and the State of Illinois. It is anticipated that the lessons learned from this workshop will further prepare our City and region for issues that may arise during a critical incident and advance continuity, preparedness and resiliency efforts.

I look forward to your continued involvement in this important strategic planning partnership.

Sincerely,

Rahm Emanuel

Mayor

Cc: Gary Schenkel, Executive Director, Office of Emergency Management and Communications

TITLE Letter from Rear Adm. Stephen R. Loeffler, USN (Ret.) to Dean Jim Wirtz

DATE January 14, 2012

CD REF NO. PW–41

14 Jan 2012

Your Deanship/Jim,

On Thursday and Friday I exchanged email with, talked to, J3 and J5 folks at PACOM, and the N3/N5 crowd at PACFLT, about RSEP support for upcoming special deployments of interest to them, namely the Pacific Partnership Program and CARAT in Southeast Asia. In both cases, at the flag/general officer level, they mentioned how important they think RSEP is and what a difference the program has made for Naval Forces deploying to the Pacific and Indian Oceans. Apparently they had seen feedback reports from the MAKIN ISLAND ARG, JOHN C STENNIS Strike Group and others with very positive comments about the program and RSEP teams.

They also reiterated how much they appreciate us offering the services of our RSEP teams to them and their staffs when we pass through Hawaii. Noting how important your interaction, as well as SIGS and NSA in general, are to them, the SUBPAC commander and staff, and the COMPACFLT Reserve Component, they could not have been more appreciative. I mentioned that CDR Wang had just set up a weekend program on campus for the CPF RC, and Rear Admiral Wehterald could not have been more appreciative. Citing recent briefs by Michael Rubin, Bob Rook, Will Norris and me, they asked to be included any time an RSEP team begins or ends a program in the Hawaiian Operating Areas. I told them that you, as Dean, ensured that any faculty working in or passing through Oahu offered their knowledge and lectures to their commands and COMSUBPAC. They send a sincere 'mahalo'.

On another subject, I picked up Wade Huntley following his nephew's graduation from boot camp at MCRD on Friday. We had a good meeting over local brews at Point Loma Seafood (Pete Lavoy's and Ahmad's favorite spot). I gave him the 2012/2013 RSEP schedule and we talked about ways to get more NSA faculty involved in RSEP. We'll discuss this and other issues, and then we would like to meet with you, when I am on campus 30 Jan-3 Feb if you are in town.

Have a great holiday weekend ~ thought the positive feedback from PACFLT and PACOM would get your weekend off to a good start.

Warm regards, Steve

Rear Admiral Stephen R. Loeffler, USN(Ret)
Senior Lecturer and Director, Regional Security
Education Program
Naval Postgraduate School
Monterey, CA
Office: 619-556-3284
Cellular: 619-647-7833

TITLE Email from Rear Adm. Stephen R. Loeffler to NPS Leadership

DATE February 24, 2012

CD REF NO. PW–42

From: Loeffler, Stephen (Steve) (CIV)
Sent: Friday, February 24, 2012 4:24 PM
To: Oliver, Daniel (VADM); Ferrari, Leonard (CIV); Haska, Christine (CIV); Wirtz, James (CIV)
Cc: Moran, Daniel (CIV); Horvath, R (Fran) (CIV); Wang, Bernard (Bernie) (CDR); Huntley, Wade (CIV); Richmond, Alan (CIV); Stewart, Karen J CIV USFF, N7
Subject: USS GREEN BAY (LPD 20) CHANGE OF COMMAND

President, Provost and All,

Normally I would not report on ship and squadron changes of command, but today's was unusual. Deborah and I attended the ceremony for USS GREEN BAY (LPD 20) aboard the USS MIDWAY Museum (GREEN BAY is in the shipyard) because we know the incoming Commanding Officer, CDR Putnam Browne, who was Executive Officer in USS CARL VINSON (CVN 70) until recently. CDR Browne also plans to enroll in the NPS MSSA program later this year, so Craig Turley and I have counseled him on the MSSA as well as SA and SE Certificate Programs here in the office.

What made the ceremony unusual was that the guest speaker, Rear Admiral Gerard Huber, Commander Expeditionary Strike Group 3, began his speech with a five-minute thank you to NPS and me for the RSEP programs we have conducted for his deploying ships and ARG's (amphibious ready groups). He noted that the programs we provided for individual ships and two ARG's with their embarked Marine Expeditionary Units (MEU's), have had a significant impact on their performance both at sea an ashore. Gerry went on to say that he had been on Skype early this morning with his son who is an ensign aboard USS PEARL HARBOR visiting the UAE and warned him to conduct himself wisely in Dubai, at which time his son said something to the effect that he and the entire crew had watched Rear Admiral Loeffler's brief on culture and conduct in the Middle East, as well the other RSEP briefs, and they know exactly what to do and what not to do on liberty in Dubai. Dean, Dan, Wade and Bernie: It's working!

Admiral Huber went on to thank NPS for continuing to support the fleet, and then he thanked me for being one of his mentors (I have known him since he was a lieutenant) and for the energy that Deborah and I continue to inject into the Navy with United Through Reading, RSEP and the USO (where I am a member of the BofD).

Since this small tribute was the lead in to his remarks as the ceremony's guest speaker, I thought I should pass it along. After the change of command ceremony, Admiral Huber went on to say that the Commodore of the MAKIN ISLAND ARG had sent a message this morning to him and the Commodore of the PELELIEU ARG, schedule to deploy in September, reiterating how important RSEP has been for his Sailors and Marines. Bernie, please pass this to the rest of the MAKIN ISLAND ARG/11th MEU RSEP Team.

Thought you would like to know and have a great weekend, Steve

RADM Stephen R. Loeffler, USN(Ret)
Director, Regional Security Education Program and Senior Lecturer
Naval Postgraduate School
Monterey, California 93943